DOE/EH-0531 (98Q2)

December 1998

DOE Performance Indicators

Environment, Safety & Health

Period Ending June 1998

DOE Operating Experience Analysis
Safety Management Through Analysis
http://tis.eh.doe.gov/oeaf/

Photos on Cover:

On August 5, 1998, the casing on a large, single-stage centrifugal pump at the Oak Ridge Y-12 Chiller Building failed catastrophically, projecting debris throughout an operating area and causing extensive damage to nearby equipment and structures. An operator received superficial cuts on the face and upper chest when pump debris struck and shattered a heavy glass window in an enclosed control area. This occurrence was a very serious near miss, as anyone in the unprotected area near the pump could have been seriously or fatally injured. (ORPS Report ORO—LMES-Y12SITE-1998-0039)

The cover photos show the effects of the failure: (1) the top left photo shows the portion of the pump remaining on its bedplate; (2) the top right photo is a view of the general area surrounding the pump showing the extent of destruction and debris scattering; and (3) the bottom photo shows an inside view of the operating enclosure where the operator was injured.

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Introduction

In our ongoing effort to provide performance indicators that best characterize the safety performance of DOE, we have replaced the Lost Workday Case Rate performance indicator with Total Recordable Case Rate. Total Recordable Case Rate is more comprehensive than the Lost Workday Case Rate and a better benchmark against private industry.

As highlighted in the 98Q1 Quarterly Performance Indicator report, a fatality occurred at the Idaho National Engineering and Environmental Laboratory Test Reactor Area on July 1998 during electrical maintenance activities. A Type A Accident Investigation was conducted and the investigation board's report can be found on the Internet at http://tis.eh.doe.gov/oversight/ or hard copies can be requested from the Office of Environment, Safety and Health's Information Center at (301) 903-8358. We urge DOE and DOE contractors to review this report to aid in strengthening their safety and work control programs to ensure a similar situation does not recur.

Trends

In reviewing overall trends for the past two years, the following general observations can be made: five of the indicators demonstrated favorable trends, five demonstrated unfavorable trends, and ten indicators demonstrated no significant trends.

Indicators showing favorable trends are as follows:

- **Cost Index** - The DOE-wide occupational safety and health cost index for 1997 continued to decrease from a five-year average of 25. Although revisions in lost worktime and late reporting will increase the cost index for the more recent quarters; the downward trend is expected to continue.
- **Environmental Releases** - The data reflected a downward trend over the past 16 quarters with the number of environmental releases remaining well below the average of 61 (for 93Q2 through 98Q1).
- **Inadequate Procedures/Procedures Not Followed** – This quarter's data strengthens the observation of a decreasing trend in procedure-related problems since 94Q3. The number of events involving procedure violations or inadequacies in 98Q2 decreased by 4.7 percent when compared to the number of events reported in 98Q1 (277).
- **Price Anderson Amendment Act Enforcement** - The number of cases self-identified by the responsible contractor via the Noncompliance Tracking System, though still a small fraction of the total reported cases, actually increased from 8 (98Q1) to 26 percent (98Q2). After continuous increases since 96Q3, the total number of cases decreased by 33 percent when compared to the last quarter (98Q1).

Several indicators show either a potential decrease in performance or the need for a focused effort to reverse the trend:

- **Chemical Hazards** - Since 97Q1, there has been an overall increasing trend in the number of chemical hazard events. In this quarter, the number of events (98) decreased but remained above the five-year average (93Q1-98Q1) of 96. Class 1 and 2 events, the more serious events, also showed a decrease for the first time since 97Q1.
- **Radiological Events** - Nine percent of the reported contaminations in 98Q2 were attributed to "clean" contractor-issued clothing from the laundry.

- **Industrial Operations Safety** – The largest contributor for this quarter were activities involving hoisting and rigging followed by excavation related events. These contributed to a 60 percent increase in the number of events for this quarter when compared to 98Q1.
- **Near Misses and Safety Concerns** – This indicator is exhibiting a four-quarter trend starting low in the fourth quarter and ending high in the first quarter. A focused effort in the latter quarters may aid in reducing the number of these potentially life-threatening events.
- **Safety System Actuations** – There was an unusual number of significant safety system actuation events reported in 98Q2; three events required activation of the Emergency operations Center and four events involved unplanned reactor shutdowns primarily due to tornado and earthquake conditions. No personnel injuries or illnesses were reported from these events. System failures, primarily in process ventilation and electrical systems, continue to constitute a significant portion of the safety system actuations reported.
- **Environmental Compliance Milestones Met** – The percentage of milestones completed for the past five quarters continues to remain below that of previous years.

Detail Opportunities

Detail slots are still available in our office for FY99. We bear most of the travel/living expenses for these details. Over the past two years, four detailees from the field have gained a better understanding of Headquarters' operations by participating in our analyst detailee program. We most recently hosted two Russian engineers representing GAN, Russia's Federal Nuclear and Radiation Safety Authority (GOSATOMNADZOR). We believe these detail opportunities are mutually beneficial. We gain valuable field insights and experience to improve our products and you gain exposure to ES&H analysis techniques and a Headquarters perspective on the development and utility of emerging programs. All past detailees have indicated that they increased their knowledge and skills in analysis of environment, safety and health data. If you or someone you know is interested in our detailee program, please email an attached resumé to Tom.Rollow@eh.doe.gov.

On the Web

This report and additional analytical tools, techniques, and data can be found at our Internet Web site. Please visit us at http://tis.eh.doe.gov/oeaf.

Contact for Additional Information

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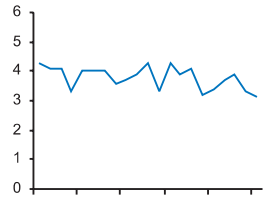
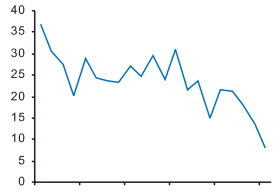
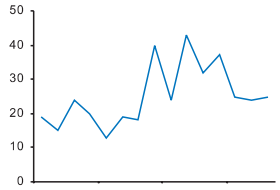
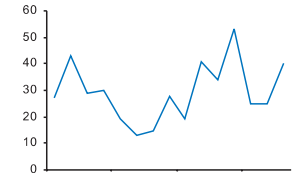
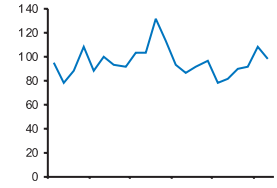
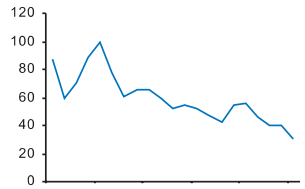
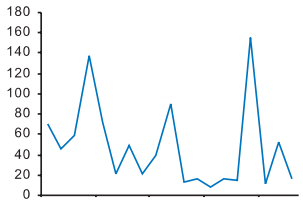
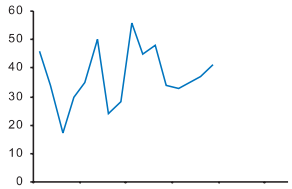
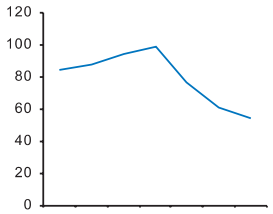
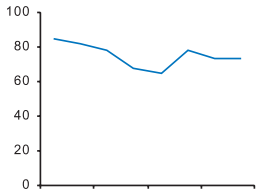
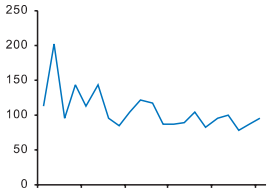
Management Summary

A new management summary format for the DOE Environment, Safety, and Health Performance Indicators is presented to allow managers to quickly view trends in all 21 performance indicators without needing to search each individual discussion. The graphical display in this section of the report combined with the discussion of key indicator trends in the Introduction should provide readers with a quick synopsis of DOE environment, safety, and health performance.

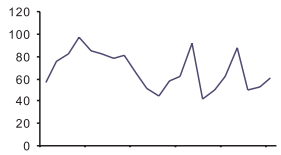
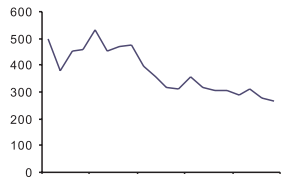
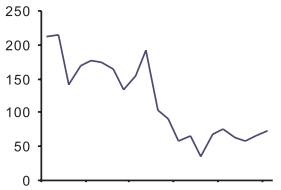
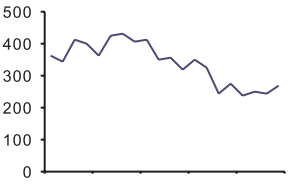
Accidents/Events Category

Performance Indicator	Trend Graph Number vs. Quarter/Year (ex. Events vs 9xQx)
Total Recordable Case Rate (Cases per 200,000 work-hours) (93Q1 through 98Q1)	
Occupational Safety and Health Cost Index (Cents lost per hour worked) (93Q1 through 98Q1)	
Electrical Safety (Events per Quarter) (94Q4 through 98Q2)	
Industrial Operations Safety (Events per Quarter) (94Q4 through 98Q2)	
Chemical Hazards Events (Events per Quarter) (93Q1 through 98Q2)	

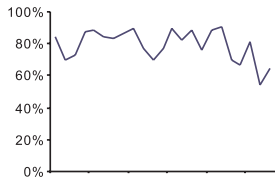
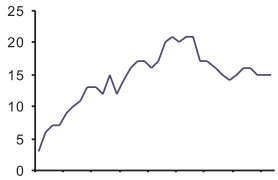
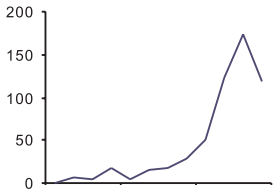
Accidents/Events Category

Performance Indicator	Trend Graph Number vs. Quarter/Year (ex. Events vs 9xQx)
Reportable Occurrences of Releases to the Environment (Events per Quarter) (93Q2 through 98Q2)	
CIted Environmental Violations (Cited Violations per Quarter) (93Q4 through 98Q2)	
Environmental Permit Exceedances (Events per Quarter) (93Q1 through 96Q4)	
Radiation Dose to the Public (Person-rem per Year) (1990 through 1996)	
Worker Radiation Dose (Average mrem per individual) (1994 through 1997)	
Radiological Events (Events per Quarter) (93Q2 through 98Q2)	

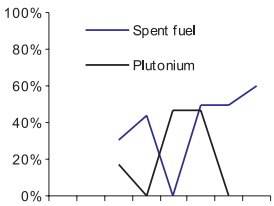
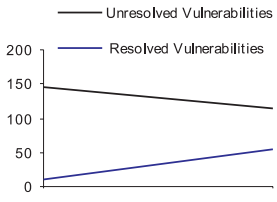
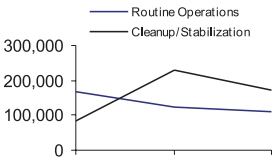
Precursors Category

Performance Indicator	Trend Graph Number vs. Quarter/Year (ex. Events vs 9xQx)
Near Misses and Safety Concerns (Events per Quarter) (93Q2 through 98Q2)	
Inadequate Procedures/ Procedures Not Followed (Events per Quarter) (93Q3 through 98Q2)	
Safety System Actuations (Events per Quarter) (93Q3 through 98Q2)	
Safety System Degradations (Events per Quarter) (93Q3 through 98Q2)	

ES&H Management Category

Performance Indicator	Trend Graph Number vs. Quarter/Year (ex. Events vs 9xQx)
Environmental Compliance Milestones Met (Percent of Milestones Met per Quarter) (92Q4 through 98Q2)	
Open DNFSB Recommendations (Recommendations per Quarter) (90Q1 through 98Q2)	
Price-Anderson Amendments Act Enforcement (Cases per Quarter) (95Q3 through 98Q2)	

Hazards Category

Performance Indicator	Trend Graph Number vs. Quarter/Year (ex. Events vs 9xQx)
Spent Nuclear Fuel and Plutonium Vulnerabilities Resolved (Percent Resolved) (Nov-94 through Feb-98)	
HEU Vulnerabilities Resolved (Resolved/Unresolved per Quarter) (97Q4 and 98Q1)	
Waste Generation (Cubic Meters per Year) (1994 through 1996)	

List of Performance Indicators

The performance indicators are organized into four major categories. The numbers correspond to the section numbers used in this report.

1. Accidents/Events that have already happened

Accidents/Events are injuries, fatalities, releases, uptakes, etc.

1. Total Recordable Case Rate
2. Occupational Safety and Health Cost Index
3. Electrical Safety
4. Industrial Operations Safety
5. Chemical Hazard Events
6. Reportable Occurrences of Releases to the Environment
7. Cited Environmental Violations
8. Environmental Permit Exceedances
9. Radiation Dose to the Public
10. Worker Radiation Dose
11. Radiological Events

2. Precursors to accidents and near misses

Precursors are events that resulted in significant reduction of barriers that are depended upon for safety.

12. Near Misses and Safety Concerns
13. Inadequate Procedures/Procedures Not Followed
14. Safety System Actuations
15. Safety Equipment Degradation

3. ES&H Management

ES&H Management includes work planning, training, manager and worker involvement, and regulatory compliance.

16. Environmental Compliance Milestones Met
17. Open DNFSB Recommendations
18. Price-Anderson Amendments Act Enforcement

4. Hazards level of material at risk

Working with the program offices and sites, we hope to show how DOE is reducing hazards and vulnerabilities.

19. Spent Nuclear Fuel and Plutonium Vulnerabilities Resolved
20. HEU Vulnerabilities Resolved
21. Waste Generation

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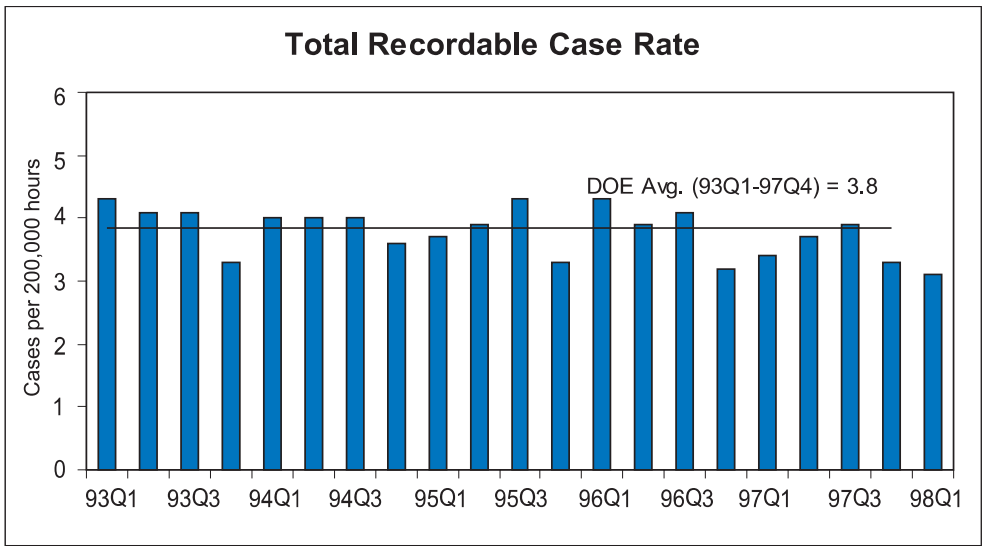
Indicator

1. Total Recordable Case Rate

Definition

Work-related death, injury or illness, which resulted in loss of consciousness, restriction of work or motion, transfer to another job, or required medical treatment beyond first aid.

Total Recordable Case (TRC) Rate is the number of total recordable cases per 200,000 hours worked. This rate does not include Federal employee recordable cases.

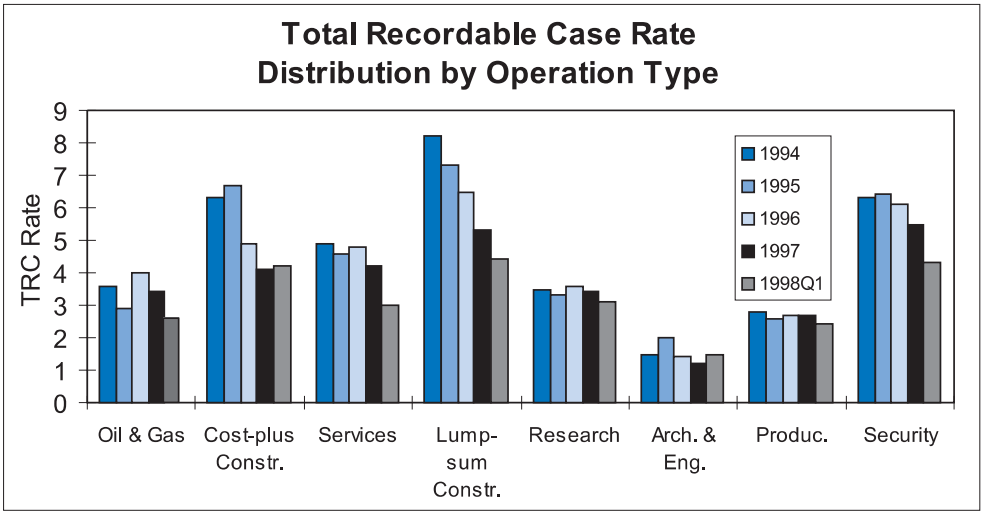


Source: DOE Data—Computerized Accident/Incident Reporting System

Key Observations

- The 98Q1 TRC rate (cases per 200,000 hours worked) attained its lowest quarterly value over the previous 5-year period primarily due to the decrease in cases involving lump-sum construction activities.
- In 98Q1, DOE contractors experienced 930 total recordable cases, a 13 percent decrease in the number of cases reported when compared to the first quarter of 1997.
- About 400 of the total recordable cases were lost workday cases; nonfatal cases without lost workdays accounted for the remaining 530 cases. The 98Q1 lost workday case rate was 1.3 per 200,000 hours worked. Similar to the trend for the TRC rate, the lost workday case rate was lower than the rate recorded for each quarter during the previous 5-year period.

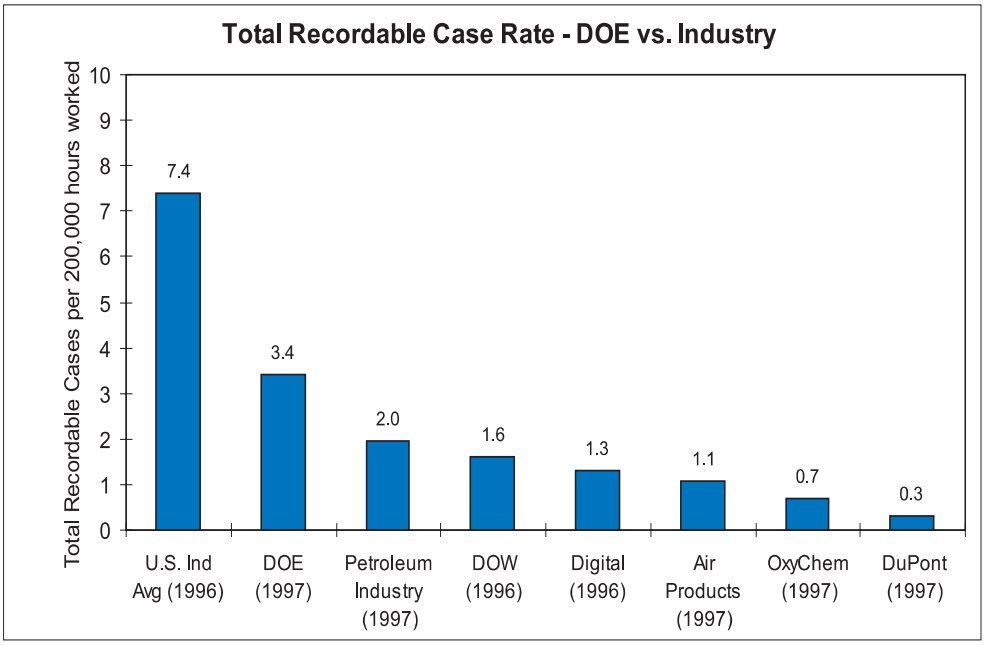
Distribution by Operation Type



- TRC rates for 98Q1 ranged from 4.3 for employees performing work activities in construction and security organizations, to 2.6 for employees working in oil and gas operations.
- TRC rates for lump-sum construction and security operations continue to exceed the 5-year average TRC rate of 3.8. However, the lump-sum construction component (major contributor to the TRC) has continuously decreased to 54 percent of its 1994 value.

Distribution by Industry

- While DOE's TRC rate is less than half the U.S. average, it is higher than that of several well-known, safety-conscious companies that utilize similar industrial processes.



Additional Analysis

Indicator

2. Occupational Safety and Health Cost Index

Definition

Represents the approximate amount of dollars lost (indirect and direct) per 100 hours worked for all injuries/illnesses using the following formula. The coefficients used in the Cost Index formula are weighing factors derived from a study of the direct and indirect dollar costs of injuries. The index is not commonly used in private industry and does not include Federal employee injuries/illnesses. DOE sites use this index to measure their progress in worker safety and health. The index is computed as follows:

Cost Index = 100 [(1,000,000) * D + (500,000) * T + (2,000) * LWC
+ (1,000) * WDL + (400) * WDLR + (2,000) * NFC] / HRS

where

D = the number of fatalities,

T = the number of permanent transfers or terminations due to occupational illness or injury,

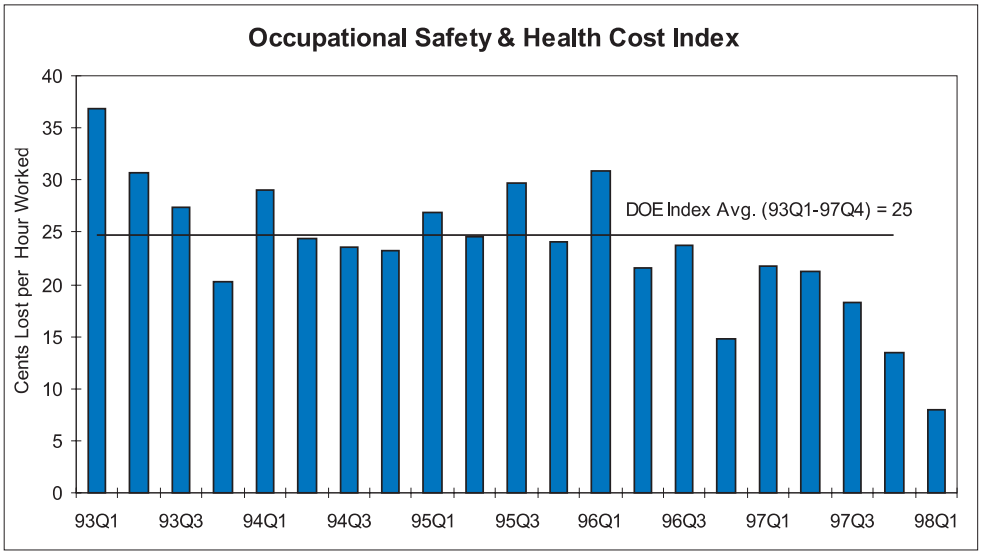
LWC = the number of lost workday cases,

WDL = the number of days away from work

WDLR = the number of restricted workdays,

NFC = the number of non-fatal cases without days away from work or restricted workdays, and

HRS = the total hours worked.



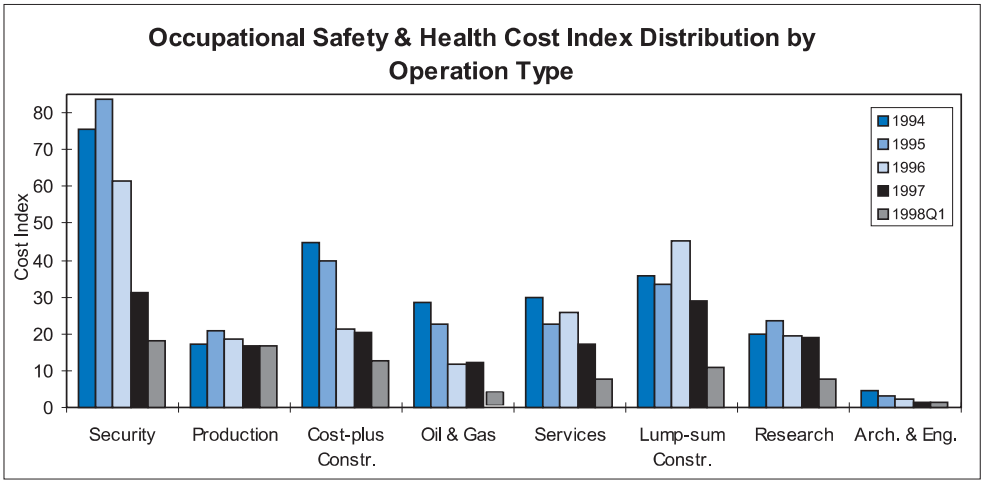
Source: Computerized Accident/Incident Reporting System.

Key Observations

- The preliminary 98Q1 cost index for DOE contractors was 7.93. When compared with the preliminary 97Q1 cost index, the 98Q1 cost index does indicate a decrease. In 97Q1, DOE contractors experienced one fatality. No fatalities occurred during 98Q1. This component of the cost index and variations in other components all contribute to the lower preliminary cost index for 98Q1.
- Analysis of the components that comprise the Cost Index show that the number of days away from work (WDL - highest contributor to the Cost Index) has significantly decreased (more than 80%) since 96Q1 and has substantially contributed to the decrease in the Cost Index.
- Although revisions in lost worktime and late reporting will typically increase the value of the cost index (30-60%), the downward trend is expected to continue.*

Additional Analysis

Distribution by Operation Type



- Estimates indicate that the 1997 cost index declined below 1996 levels. Operations involving security and lump sum construction activities reported the highest Index for 1997: 30.15 and 28.66, respectively.
- Security and total construction operations continue to have the highest cost indices for the past 5 years. However, for 98Q1 and for the first time, the cost index for production activities (which has been fairly constant since 1992) exceeded the cost index for total construction activities.

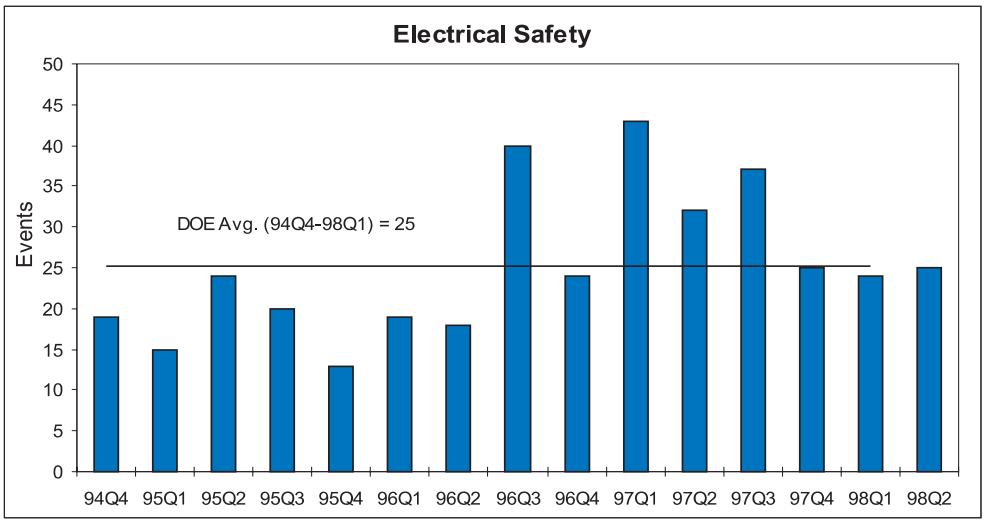
*An unfortunate accident at the Idaho National Engineering and Environmental Laboratory claimed the life of a DOE worker when an accidental discharge of a fire extinguishing system occurred during electrical maintenance. This fatality will cause a higher than normal increase in the Cost Index.

Indicator

3. Electrical Safety

Definition

The number of events involving worker contact or the potential for contact with electrically energized equipment. These events are reportable under DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.



Source: Review of Occurrence Reports by Department Analysts.

Key Observations

- After decreasing from a 3-year high of 43 events in 97Q1, the number of electrical safety events has held steady over the last 3 quarters at an average of 24.7 events per quarter. The following table shows the average number of events and number of events per 200,000 person-hours.

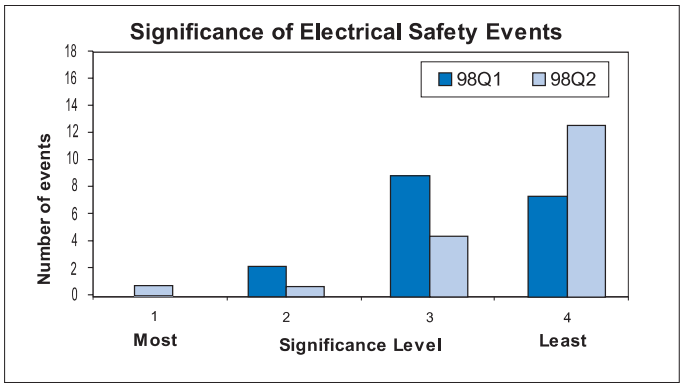
Period	Avg. Events	Avg. Events/200,000 Hrs
94Q4 - 96Q2	18.4	0.063
96Q3 - 98Q2	31.3	0.131*

*98Q2 total work-hour data are not available to calculate event rate at this time.

- Two possible causes exist for the increase in the number and rate of events. The first, as reported in the 96Q3 PI Report, was a change in the way the events were categorized since 96Q3. The second cause is an increased sensitivity to electrical safety problems generated by serious electrical safety incidents in the DOE complex around the time of the shift.
- Although positive in nature, the stabilization of electrical events over the last 3 quarters at a lower level than previous quarters does not constitute a statistically valid change in the baseline. Additional data and analyses are required to determine if the recent data is indicative of improved electrical safety performance throughout the DOE.

Significance of Events

Significance of electrical safety events is ranked in accordance with Table 1, *EH-33 Performance Indicator Significance Criteria*, which is included in Appendix B-3 of this report. Significance ranking of electrical safety events started in 98Q1. The following graph shows the distribution of event significance for the last two quarters.

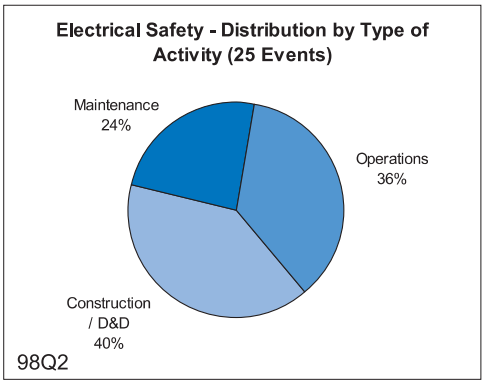


- In general, the events that occurred in 98Q2 were less significant than the previous quarter. The exception was a single Level 1 event that occurred in May 1998 at the Kansas City Plant, where an electrician received first, second, and third degree burns from an electrical flash that occurred while he was working on a 13.8 kV switch. The event was categorized as Level 1 because the electrician's injuries caused him to be out of work for over 30 days.
- The single Level 2 event involved an electrician who required hospitalization after receiving a first-degree burn when he was exposed to an electrical arc flash. The flash occurred when a holding screw penetrated the insulation on line-side wiring as the electrician was re-installing a circuit breaker.
- Two of the Level 3 events involved workers incorrectly assuming that the wires or conduit they were about to work on were de-energized.
- In 98Q1, four events occurred during excavation or floor cutting. In 98Q2, there were five excavation-related events, all Level 4.

Additional Analysis

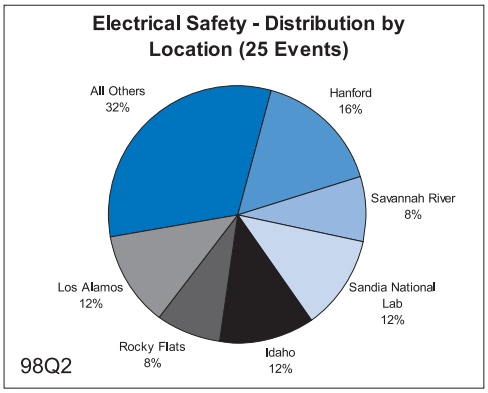
Distribution by Activity

- The electrical safety events reported for 98Q2 fall into 3 major categories: construction, maintenance, and operations activities. Forty percent of the events occurred during construction or decontamination and decommissioning activities. Half as many events occurred during maintenance in 98Q2 than in 98Q1.



Distribution by Location

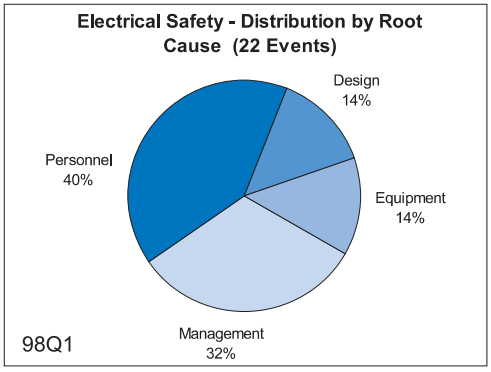
- As in past quarters, 98Q2 electrical safety events were distributed equally among sites, with no site reporting more than 3 events. Eight of the 15 sites reporting events, reported only one event.
- At LANL, there were three events compared to only one in each of the previous three quarters. Two were excavation events rolled up into the same occurrence report and the third was a minor shock caused by a defective plug. All three were low significance events, indicating that LANL may be sustaining the improved electrical safety performance highlighted in the last PI report. The improved performance was attributed to the implementation of a new electrical safety program that included training over 1500 individuals. The following table quantitatively shows the improvement at LANL since 97Q2.



Period	96Q3-97Q2	97Q3-98Q2
Total Events	22	6
Avg. Events/Qtr	5.5	1.5

Distribution by Root Cause

- The distribution of 98Q1 electrical safety events by root cause is similar to the previous three quarters, with 72% of events caused by either management problems or personnel error.

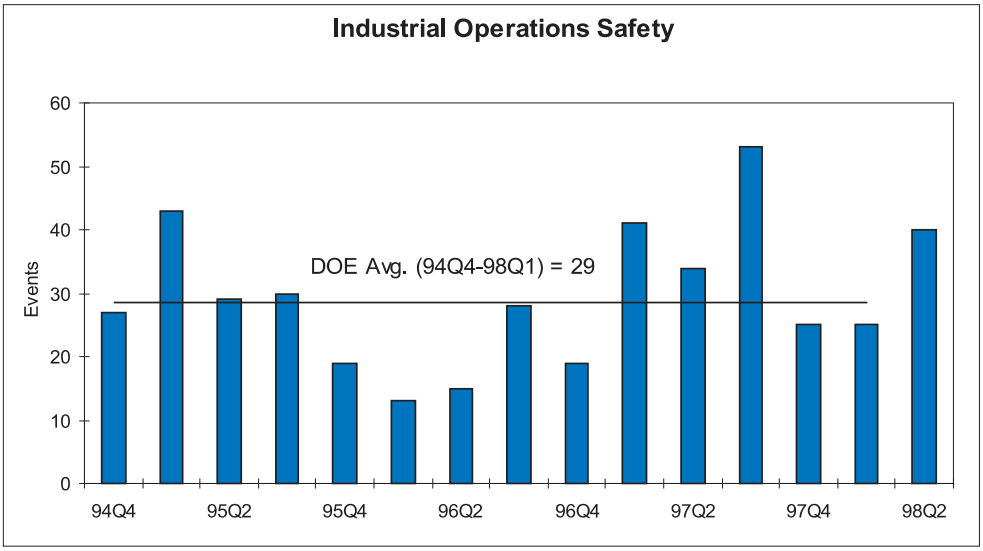


Indicator

4. Industrial Operations Safety

Definition

Number of operations-related events involving construction equipment, forklift operations, machining operations, hoisting, rigging, or excavation reportable under DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.



Source: Review of Occurrence Reports by Department Analysts.

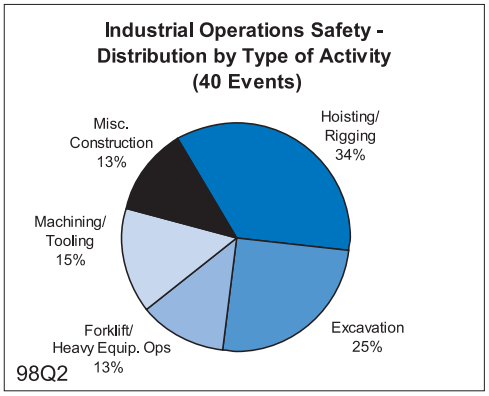
Key Observations

- The number of industrial operations safety related events increased by 15 events (or 60%) in 98Q2 as compared to 98Q1.
- The single largest contributor to the increase identified this quarter was the increase in hoisting/rigging related events.

Additional Analysis

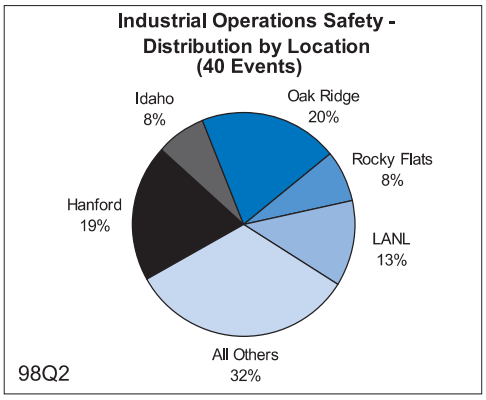
Distribution by Activity

- Consistent with previous quarters, hoisting/rigging and excavation related events dominated this indicator. As noted above, the largest contributor to the overall increase identified in 98Q2 was an increase experienced in the hoisting/rigging events.
  - Eight of fourteen hoisting/rigging related events involved crane hoisting operations. Of these, 3 events resulted in minor injuries to workers.
  - The number of excavation related incidents increased only slightly over 98Q1: 8 to 10.
- Another category not identified in previous reports has exhibited an increased number of events this quarter. These events involved various machining/tooling/drilling activities not identified as excavation related. This new category bears closer watching in upcoming quarters.



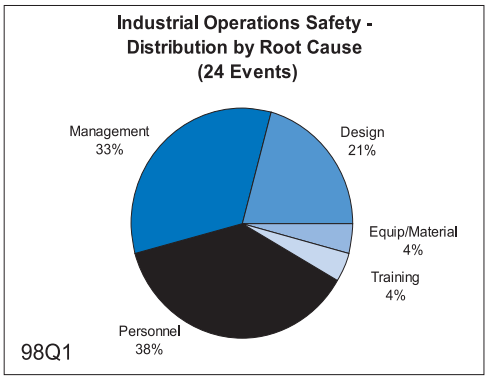
Distribution by Location

- For 98Q1, Hanford, Oak Ridge, and Fernald had the largest number of industrial operations events (4 each). Though Hanford and Oak Ridge continue to have the largest number of events (8 each), Fernald experienced no industrial operations safety events this quarter.
- Los Alamos, which had no events in 98Q1, had 5 events in 98Q2. These events involved striking electrical cables during excavation activities (2 events), manlift operations (2 events), and crane issues (1 event).
- The other location that was not a factor last quarter that emerged in 98Q2 was Rocky Flats. (0 events in 98Q1 and 3 events in 98Q2.) 2 involved contacting or nearly contacting energized electrical circuits during drilling and construction activities, while the third involved a lathe that fell over during installation.



Distribution by Root Cause

- Of the 25 events identified in 98Q1, 24 had root causes established at the time of this report.
- The major causes in 98Q1 were consistent with root causes identified in 97Q4 (Management, Personnel and Design.)
  - The most common Personnel related root cause cited was Inattention to Detail.
  - The most frequently cited Management root cause was Work Organization/ Planning Deficiency.
  - The most frequently cited Design root cause was Drawing, Specification, or Data Errors.



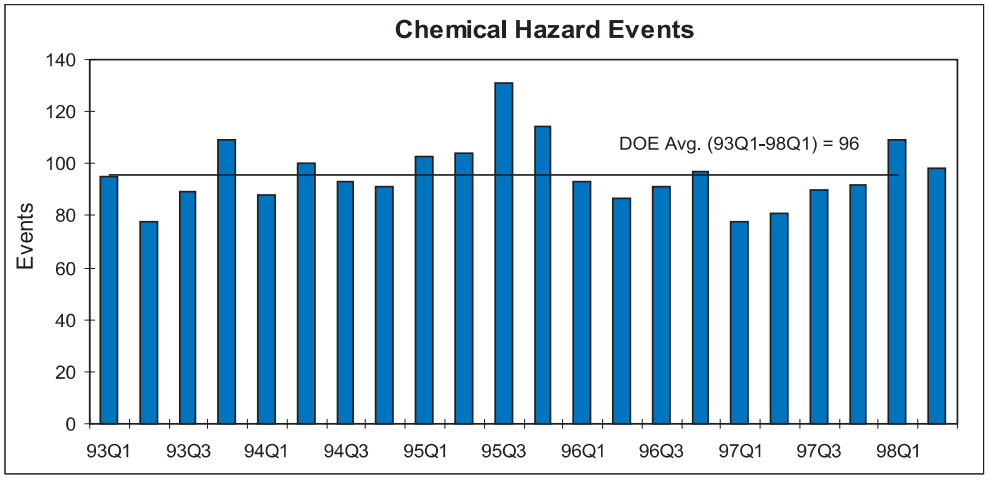
Indicator

5. Chemical Hazard Events

Definition

Number of events reportable under DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*, that are gathered by a word search for specific chemical names. The selected events are reviewed and screened for conditions meeting one of the following categories:

- Class 1 - An injury or exposure requiring hospital treatment or confirmed, severe environmental effect.
- Class 2 - Minor injury (first aid) or exposure, or minor environmental damage.
- Class 3 - Potential precursors to the occurrences in Class 1 or 2.
- Class 4 - Minor occurrences such as leaks, spills, or releases that are significant by the frequency, but not by the consequences.

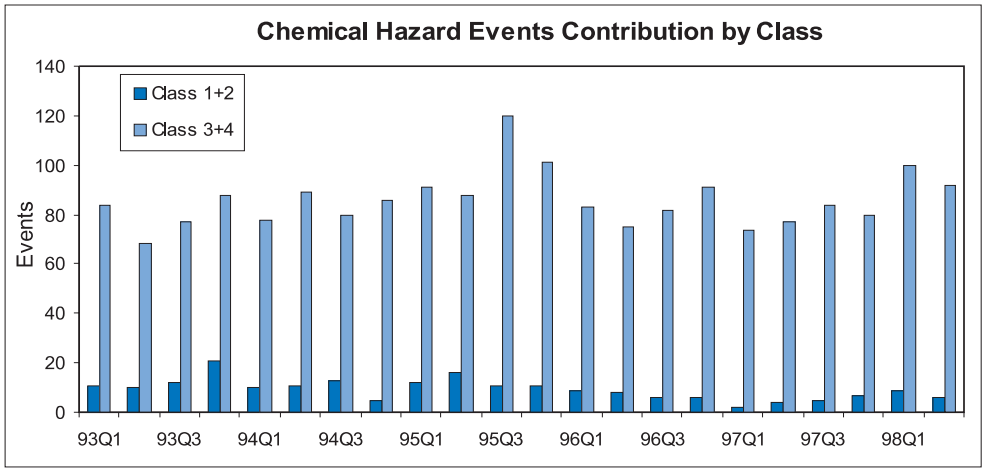


Source: Office of Field Support, EH-53, Chemical Safety Concerns: A Quarterly Review of ORPS (draft, posted on the Web at http://www.dne.bnl.gov/etd/csc/)

Key Observations

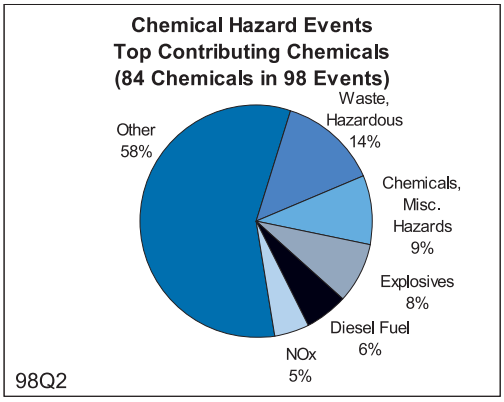
- There was an 11% drop in the number of chemical hazard events in 98Q2. Also, the number of events remained slightly above the five-year average (93Q1-98Q1) for the second consecutive quarter and only the third quarter since 95Q4. Lastly, there continues to be an increasing trend in the number of chemical hazard events since 97Q1.
- Until 98Q2, there had been a steady increase in the number of Class 1 and 2 events reported over the previous 5 quarters, however, in 98Q2 there was a decrease in the more severe events.

Characterization of Chemical Hazard Events



- During 98Q2 there were no Class 1 events.
- There were 6 Class 2 events this quarter.
  - 3 events involving exposure or potential exposure to nitric acid. Of particular concern was the fact that 2 of these 3 events also involved overpressurized storage containers that compounded the hazard to the workers.
  - The remaining 3 events involved exposure or potential exposure to beryllium, lithium oxide, aluminum trichloride, and hydrogen chloride.

Distribution by Chemicals Involved

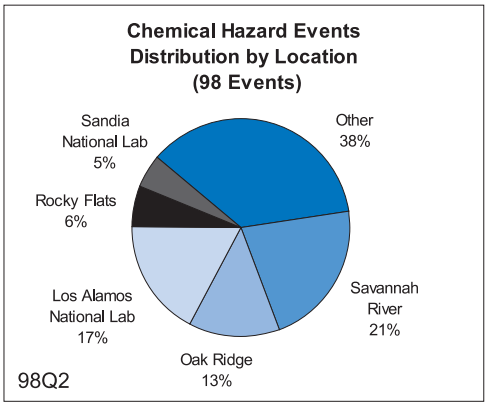


- The chemical hazard most often involved in 98Q2 was hazardous waste with 12 events.
- Hydrogen events, the leading contributor in 98Q1 with 12 events, were down this quarter with only 2 events reported. This is the lowest number of these events reported since 96Q2 and the second lowest in the last 20 quarters.
- The remaining categories were consistent with previous quarters.

Additional Analysis

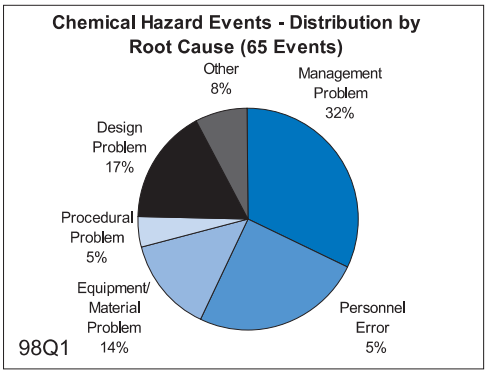
Distribution by Location

- The Savannah River Site and the Oak Ridge Reservation continue to be among the leading chemical hazard event sites. This has consistently been the case for the past 5 quarters.
  - Of the events reported at Savannah River, all were Class 3 and 4 events and the majority involved waste storage operations at the site. These ranged from waste tank concerns to mixed and hazardous waste labeling and packaging.
  - The events at Oak Ridge involved a variety of hazards including, uranium, hydrogen fluoride, Halon, and PCBs among others.
- The largest increase experienced over the last quarter was at the Los Alamos National Laboratory. This site experienced 17 events in 98Q2, significantly greater than the average from 95Q1 to 98Q1, 6.7 events.

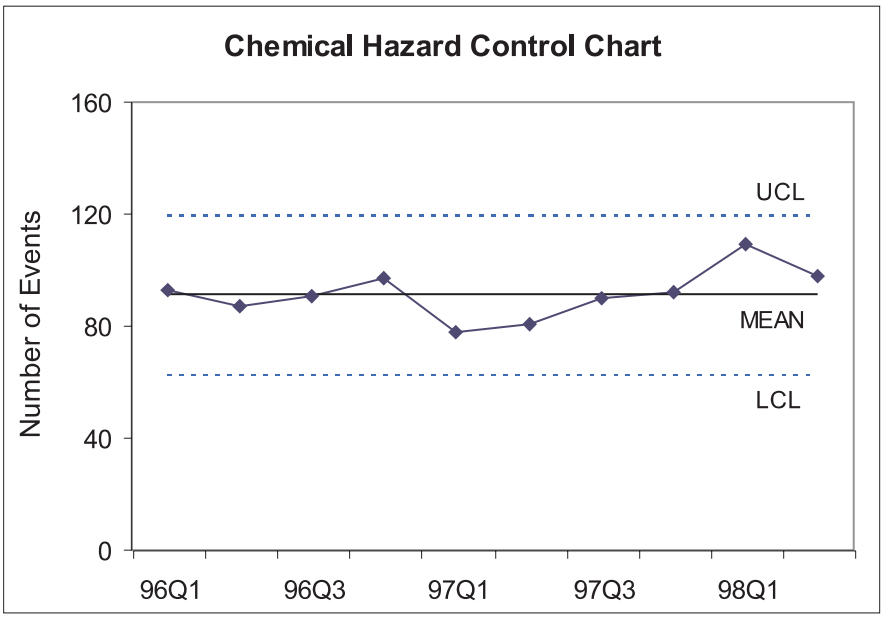


Distribution by Root Cause

- Of the 109 chemical hazard related events reported in 98Q1, 65 had root causes assigned. Of these, the top 3 categories were management problems (21 events), personnel errors (16 events), and design problems (11 events.)
  - Of the management problems cited, policy not adequately defined, disseminated, or enforced and work organization/planning deficiency were the most frequently determined specific causes.
  - Of the personnel errors cited, inattention to detail and procedure not used or used incorrectly were the most frequently determined specific causes.
  - Of the equipment/material problems cited, defective or failed part and containment were the most frequently determined specific causes.



Statistical Process Control (SPC) Analysis



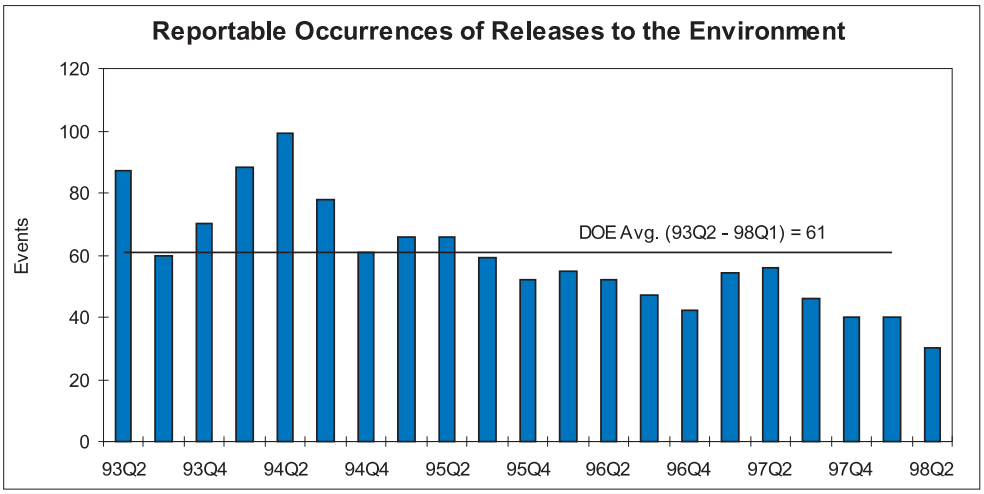
- The observed increasing trend in number of events was stopped in this quarter and remains within the control limits for this process.

Indicator

6. Reportable Occurrences of Releases to the Environment

Definition

Releases of radionuclides, hazardous substances, or regulated pollutants that are reportable to federal, state, or local agencies.



Source: Review of Occurrence Reports by Department Analysts.

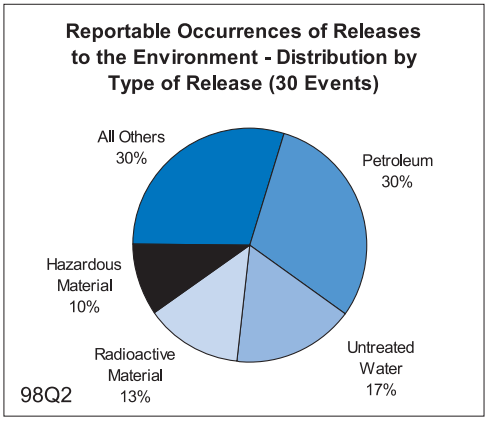
Key Observations

- The data reflects a downward trend over the past 16 quarters. Over the last 11 quarters, the number of environmental releases remained well below the five year average of 61.
- One of the release occurrences reported during 98Q2 was an emergency event involving a spill of Phosphoric Acid at the department's Rocky Flats Site. This spill of approximately 2 gallons was a concern both from a hazardous (acid vapors) and radioactive (alpha contamination) standpoint. However, no personnel were either injured or contaminated as a result of the event. The event occurred at the Liquid Waste Treatment facility involved with Plutonium Processing and Handling operations.

Additional Analysis

Distribution by Type of Release

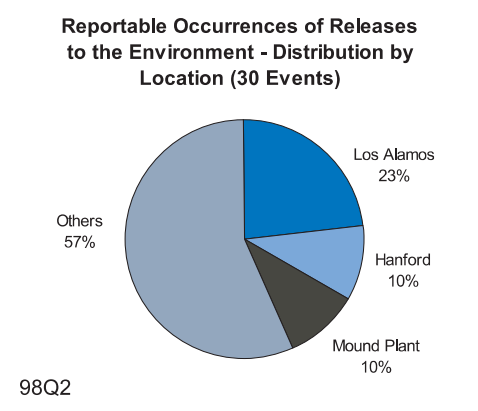
- Releases of petroleum products continue to account for a majority of the reported events. Nearly all of these events involved relatively small amounts of diesel fuel or hydraulic oil (< 1 barrel.) Only 1 event exceeded this amount when nearly 9 barrels of fuel (427 gallons) leaked from an emergency generator diesel fuel storage tank at the Department's National Renewable Energy Laboratory in Golden, Colorado.



- The second largest type of material released this quarter was untreated water. These releases were from a variety of sources including cooling tower and well water systems.
- Other reported releases of significance included the identification of an unspecified amount of legacy high explosive residues in the perched groundwater aquifer at the Pantex Plant, the release of approximately 10 gallons of a mixture of hydrochloric acid, ferric oxide and heat transfer fluid from a wet oxidation process leak at Savannah River's TNX facility and 2 reported releases of tritiated water above the daily activity limit at the Thomas Jefferson National Accelerator facility.

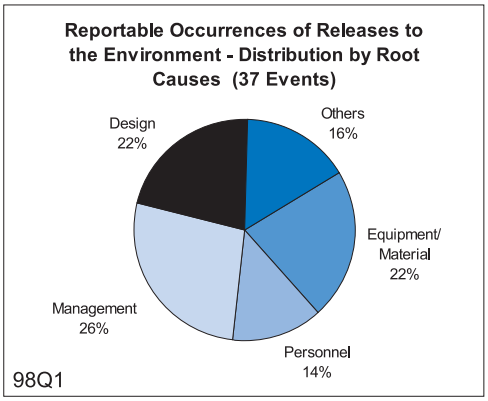
Distribution by Location

- Last quarter's primary locations, Oak Ridge and Idaho, were replaced by Los Alamos and the Mound Plant in 98Q2. Hanford remained a significant source of release events.
- The emergence of LANL (7 events in 98Q2, up from 2 in 98Q1) was largely due to releases resulting from the replacement of potable water wells supplying Los Alamos County and the National Lab. These releases involved untreated well water, hydraulic fluid and diesel fuel from incidents that were the result of drilling activities and removal and installation of the wells. The Mound Plant in Ohio reported no releases last quarter. However, this quarter they reported 3 separate NPDES permit exceedances; for suspended solids (TSS), carbonaceous biological oxygen demand (CBOD), and sewage.
- The decrease in events at Idaho (no events in 98Q2, down from 7 in 98Q1) was due to the elimination of a variety of release types including; sewage, oil, hazardous landfill waste as well as airborne emissions. The decrease in the reported releases by the Oak Ridge Operations Office were primarily due to the reduction in NPDES permit exceedances at the Weldon Springs Site.



Distribution by Root Cause

- For those release events reported in 98Q1 when compared to 97Q4, the number whose root causes were attributed to management and personnel problems dropped (from 8 to 5 and from 14 to 10 respectively) by over 30 percent. Conversely, the number of design related events rose from 3 in 97Q4 to 8 in 98Q1.
- The majority of the design related events were caused by inadequate or defective design (5 out of 8 events) and drawing, specification, or data errors (2 out of 8 events.)

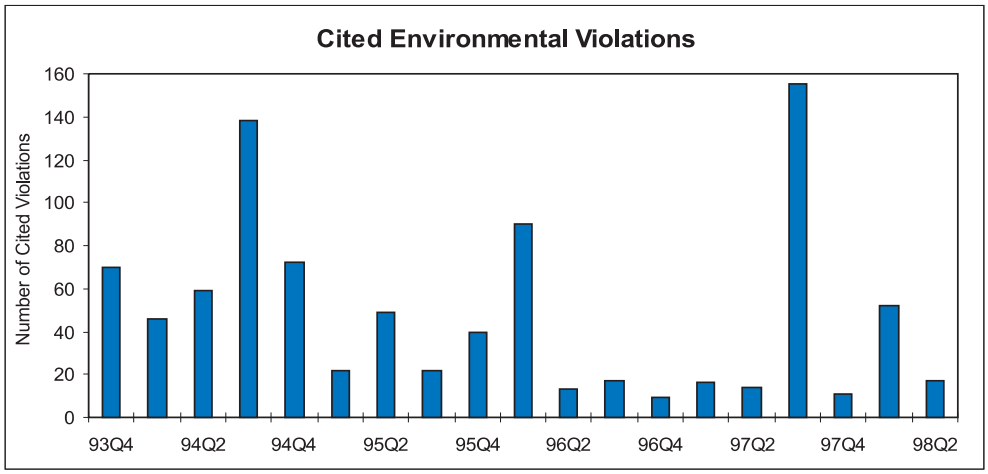


Indicator

7. Cited Environmental Violations

Definition

Number of environmental violations cited in enforcement actions, e.g., Notices of Violations (NOVs), by regulators at DOE facilities. (An NOV may cite one or multiple violations).



Source: EH-41 Compliance Database.

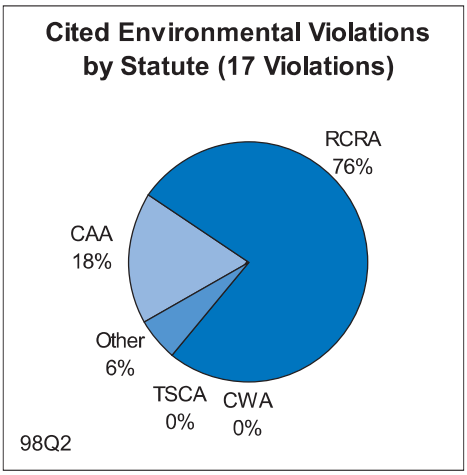
Key Observations

- Seventeen violations, in ten Notices of Violation, were cited in 98Q2.
- A large number of fines were assessed in the second quarter, with a record total dollar amount assessed – mostly for RCRA (Resource Conservation and Recovery Act) violations.

Additional Analysis

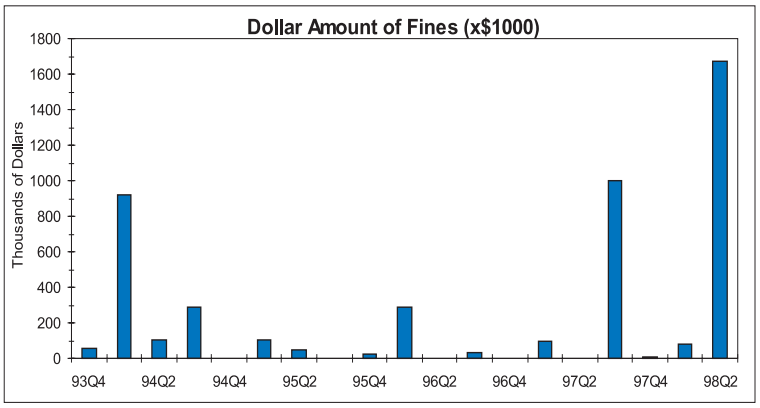
Violations by Statute

- RCRA violations predominate; this is consistent with most previous quarters.
- The "Other" violation was cited for an exceedance of water discharge standards established under CERCLA.
- This is the first quarter since 95Q4 in which there were no Clean Water Act violations.

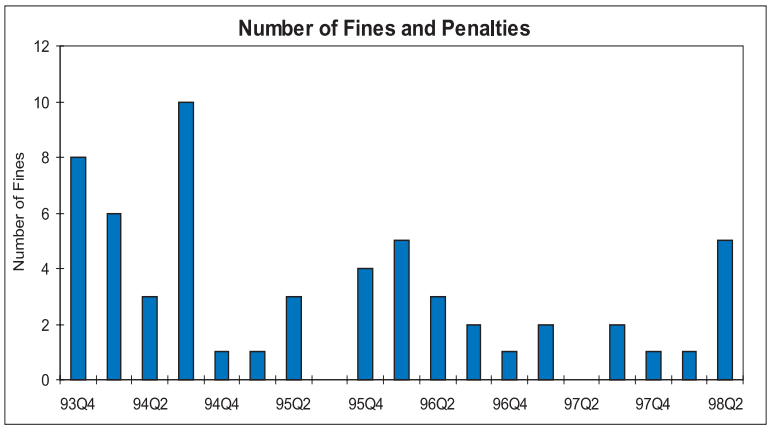


RCRA = Resource Conservation & Recovery Act (and related state laws)
CAA = Clean Air Act (and related state laws)
CWA = Clean Water Act (and related state laws)
TSCA = Toxic Substances Control Act (and related state laws)

Fines



- Five large fines were assessed in 98Q2, for four RCRA violations. The two largest, totaling $1,539,000, were assessed for 6 RCRA violations at Los Alamos.
- A fine of $45,000 was assessed at Rocky Flats under CERCLA, for exceedance of a surface water discharge standard established in the Rocky Flats Cleanup Agreement.



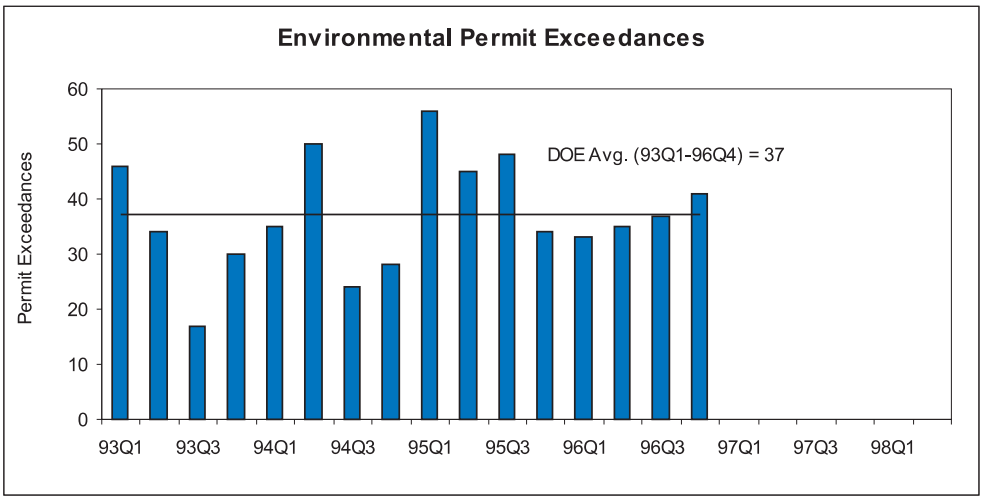
Indicator

8. Environmental Permit Exceedances

Definition

Exceedance of release levels specified in air and water permits during the quarter.

No change to this section since last report.



Source: Annual Site Environmental Reports, additional site data.

Key Observations

- After an increase in the number of permit exceedances each year from 1993-1995, the exceedances for 1996 showed a 20 percent decrease from those tabulated in 1995 (146 in 1996 versus 183 in 1995).
- In 1996, as in previous years, the vast majority (96.5 percent) of exceedances were due to violations of permits under the Clean Water Act for discharge to surface waters.

Additional Analysis

- Since 1993, there has been a trend in permit exceedances becoming more evenly distributed across more sites instead of being concentrated at a few sites.
- Most exceedances (96.5 percent) continued to occur under National or State Pollution Discharge Elimination System Permits. These permits are mandated by the Clean Water Act to protect surface waters by limiting effluent discharges to receiving streams, reservoirs, ponds, etc. Other permit exceedances occurred under Clean Air Act permits (1.4 percent) and the Safe Drinking Water Act/ Underground Injection Control permits (2.1 percent).
- Twenty of the 51 sites (39 percent) that reported for 1996 indicated that no permit exceedances occurred at their sites.

Note: The number of exceedances—and the number of potential exceedances—was a function of the permit-specific parameters, number of outfalls at a facility, reporting frequency requirements, and the timing of renewal or changes to the NPDES/SPDES permit. In addition, changes in temperature, sunlight, and precipitation events all contributed to permit exceedances of non-toxic reporting parameters such as Biological Oxygen Demand, pH, and Total Suspended Solids.

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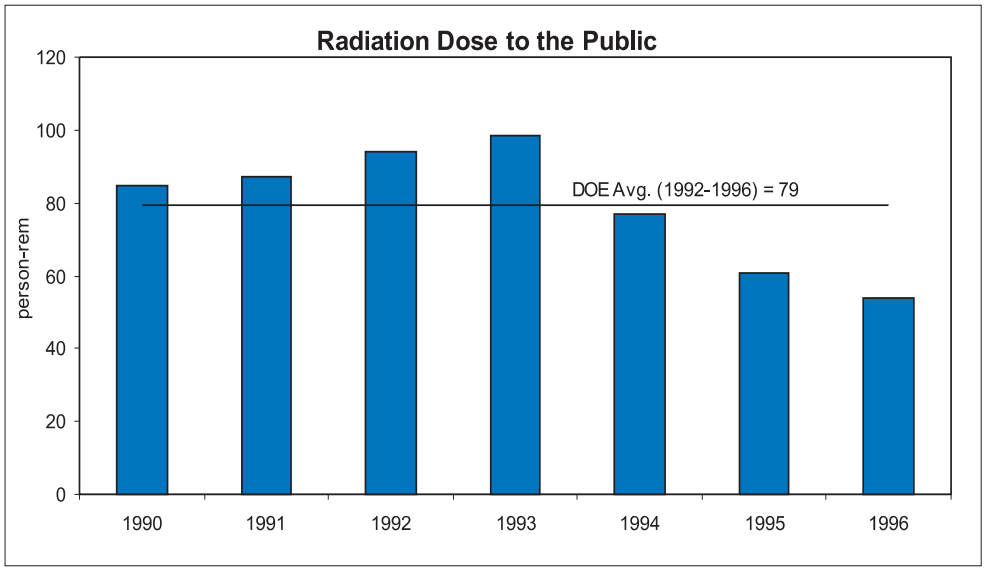
Indicator

9. Radiation Dose to the Public

Definition

Total collective radiation dose (person-rem) to the public within 50 miles of DOE facilities due to radionuclide airborne releases. ("Collective radiation dose" is the sum of the effective dose equivalent to all off-site people within a 50-mile radius of a DOE facility over a calendar year.)

No change to this section since last report.



Source: Annual reports to EPA; EH-41 data tabulation.

Key Observations

- Total collective radiation dose to the public from DOE sources was very low compared to the public dose from natural background radiation. The total collective radiation dose to the public around DOE sites from air releases was one ten-thousandth of the dose received by the same population from natural background radiation.
- Total collective radiation dose to the public in 1996 decreased 12 percent from the previous year. This continued the recent downward trend, attributable to reduced nuclear production activities.

Additional Analysis

- The top five sites in 1996 (in order: Rocky Flats, Oak Ridge, Savannah River, Princeton Plasma Physics Laboratory, and Fernald) accounted for about 72 percent of the total dose.
- The dose from Rocky Flats increased from negligible in 1995 to 10.5 person-rem in 1996 due to decontamination and decommissioning work, particularly excavations at the T-3 and T-4 trenches as part of the site remediation program.
- The dose from Princeton increased from negligible in 1995 to six person-rem in 1996 due to nonroutine upgrades to diagnostic systems which resulted in some additional tritium exhausted to the atmosphere.

- The decrease in collective radiation dose in 1996 reflected decreases in the dose from Lawrence Berkeley, Lawrence Livermore 300 Area, and Argonne-East; in 1995 they accounted for 42 percent of the dose; and in 1996 less than 7 percent. While the graph on the previous page reflects this overall decrease in collective radiation dose in 1996, there were large increases in 1996 at Rocky Flats and Princeton.

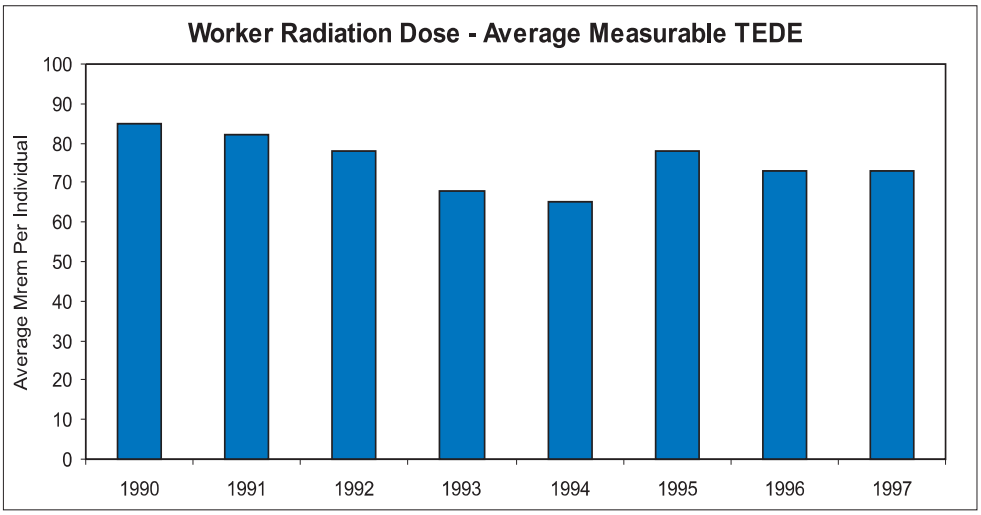
Indicator

10. Worker Radiation Dose

Definition

Average measurable dose to DOE workers, calculated by dividing the collective total effective dose equivalent (TEDE) by the number of individuals with measurable dose.

TEDE is determined by combining both internal and external contributions to an individual's occupational exposure. The number of individuals receiving measurable dose is used as an indicator of the exposed work force size.



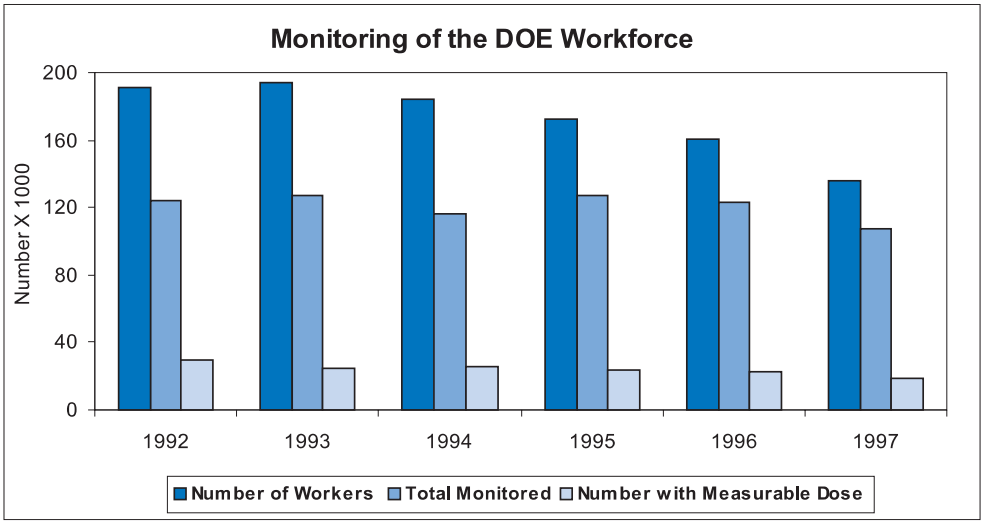
Source: U.S. Department of Energy, DOE/EH-52 and DOE Occupational Radiation Exposure Report.

Key Observations

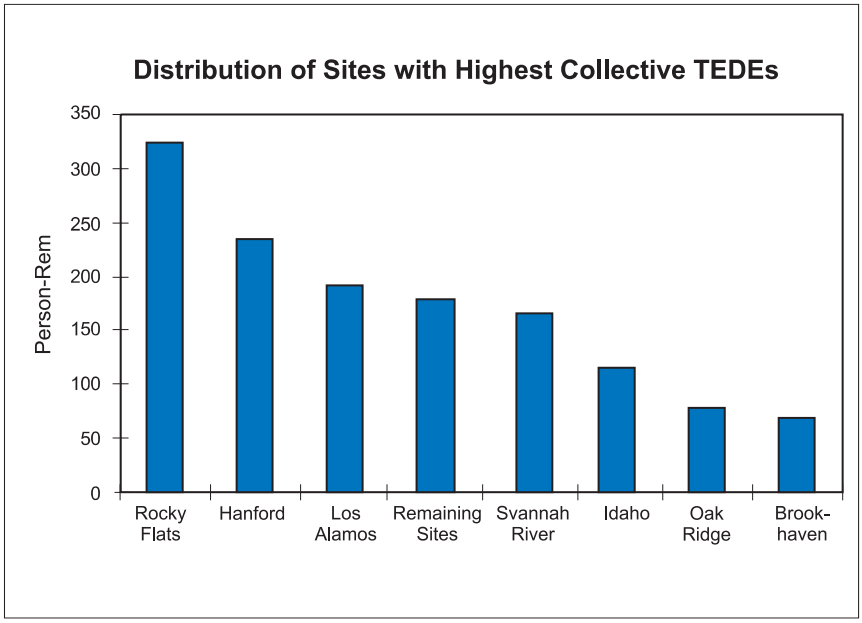
- Between 1996 and 1997, the DOE collective total effective dose equivalent decreased by 18 percent due to decreased doses at 5 of the 7 dose sites with the highest radiation dose. Further, transfer of regulatory authority of the Paducah and Portsmouth Gaseous Diffusion Plants to the Nuclear Regulatory Commission account for 1.8 of those percentage points, as that dose is no longer reported to the DOE.
- There was one exposure (estimated at 15-30 rem; estimated doses are not included in the 1997 collective TEDE) over the DOE five-rem TEDE limit associated with an intake of Curium-244 at Lawrence Livermore National Laboratory. The identified root causes were management's failure to adequately analyze, control, and manage a hazardous waste treatment operation (HEPA filter shredding). There were three additional exposures that exceeded the DOE Administrative Control Limit of two rem but did not exceed the five-rem limit.
- There is a statistically significant increase in the mean of extremity doses each year since 1994 (60%).
- The dose associated with neutron exposure continues to decrease primarily due to reduction in plutonium handling activities at Los Alamos National Laboratory (41% of the neutron dose over the past 3 years).

Additional Analysis

- Additional information concerning exposure received by individuals associated with DOE activities is included in the DOE/EH-0564, *Occupational Radiation Exposure Report 1997* (on line at http://rems.eh.doe.gov/annual.htm).

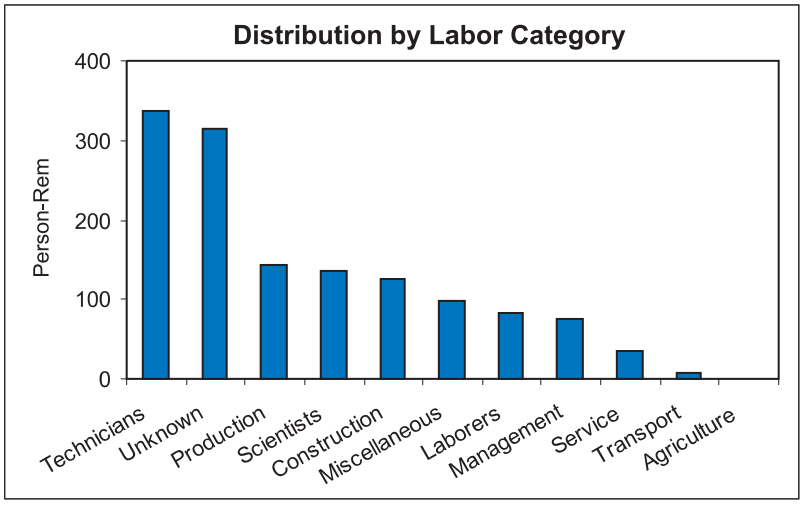


- The percentage of the DOE workforce monitored for radiation exposure has decreased by 12 percent from 1992 to 1997. However, most of the monitored individuals do not receive any measurable radiation dose. Only 19 percent of monitored individuals (14 percent of the DOE workforce) have received a measurable dose during the past 5 years.

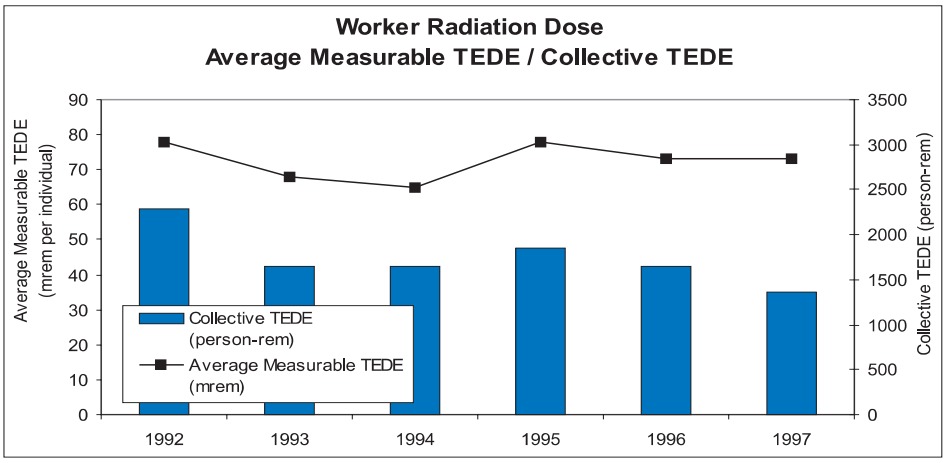


- 87 percent of the collective TEDE for the DOE Complex was accrued at 7 DOE sites in 1997. These 7 sites were (in descending order of collective dose) Rocky Flats, Hanford, Los Alamos, Savannah River, Idaho, Oak Ridge, and Brookhaven. It should be noted that Rocky Flats and Hanford accounted for 41 percent of this dose and are the two largest contributors to the collective TEDE. These sites were primarily involved in nuclear materials stabilization and waste management.

Savannah River and Brookhaven experienced the largest percentage decreases (34 and 41 percent) in collective TEDE of the 7 sites.



- Technicians continue to receive the highest collective dose of any specified labor category.
- Of the technicians, forty-two percent of the dose is attributed to radiation protection technicians.



- The number of workers with measurable internal dose increased by 19% from 1996 to 1997, and the collective TEDE increased 15% primarily due to reporting of radon doses by the Grand Junction Office for the first time in 1997. The radon doses are the result of environmental remediation activities of uranium tailings at the former Monticello uranium mill site. 1997 is the first year radon was tracked as a source of occupational exposure for DOE.
- At Rocky Flats, the collective neutron dose increased 120 percent in 1997 because of activities related to product stabilization and decommissioning and decontamination activities.

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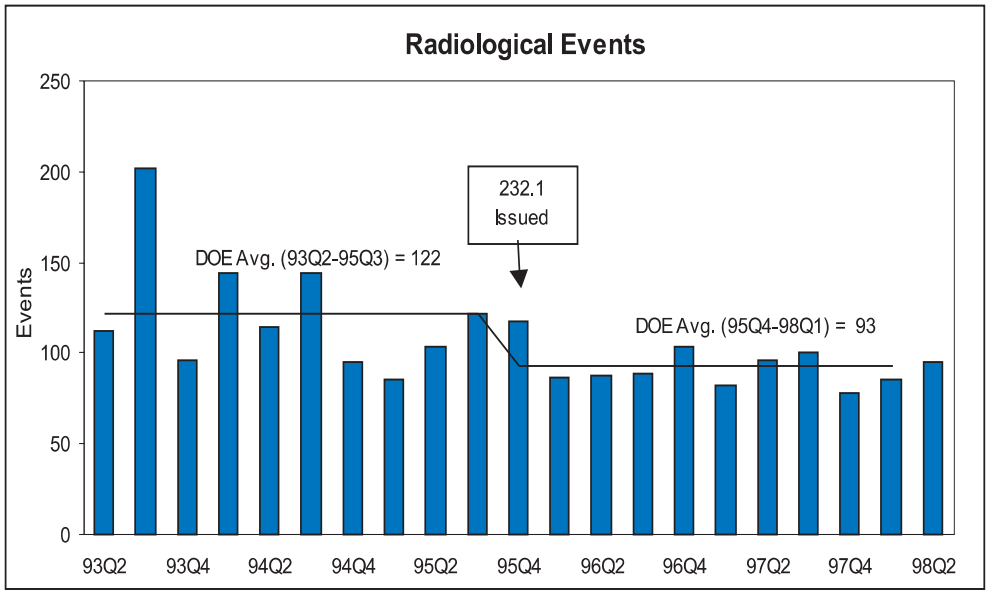
Indicator

11. Radiological Events

Definition

Number of reportable radiological events as defined in DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*. These events are made up of both personnel contaminations and radiation exposures that are reported as personnel radiation protection events.



Source: Review of Occurrence Reports by Department Analysts.

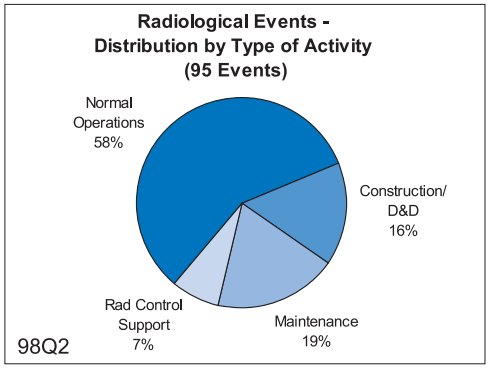
Key Observations

- The number of radiological events reported per quarter, since 96Q1 demonstrated no statistically significant change in Departmental performance.
- One hundred and twenty-two individuals were contaminated in the 95 reported radiological events in 98Q2 as compared to an average of 112 contaminated individuals per quarter in calendar year 1997. Twenty personnel were contaminated in two separate events at Oak Ridge Office's X10 and Paducah Gaseous Diffusion Plants.
- In the 97Q2 performance indicator report, it was noted that the source of five personnel contaminations was suspected to be "clean" contractor-issued clothing from the laundry. In 98Q2, 11 of the 122 personnel contaminations (9%) attributed the "clean" laundry as the source of the contamination. A few sites have stepped up monitoring programs to include radiation monitoring of clean laundry. This observation will warrant further scrutiny to assure radiological control programs are adequate to provide proper protection of the workforce.

Additional Analysis

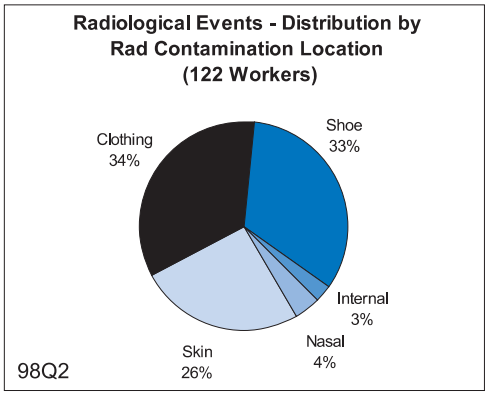
Distribution by Activity

- The distribution of radiological contamination events by the type of activity taking place at the time of the contamination is nearly identical to that observed in 98Q1.



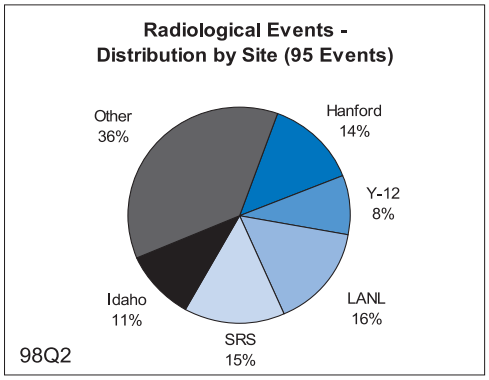
Distribution by Radiological Contaminant Location

- Forty-nine of the 95 radiological events reported in 98Q2 identified the specific isotope involved in personnel contaminations. Of these personnel contaminations; 11 involved Cesium-137, 10 involved Plutonium, 10 involved Iodine-131 (one event), 9 involved Technetium-99 (one event) and 5 involved Cobalt-60. With the exception of Iodine-131 and Technetium-99 (which can be viewed as outliers), the distribution is roughly consistent with that reported in previous quarters.



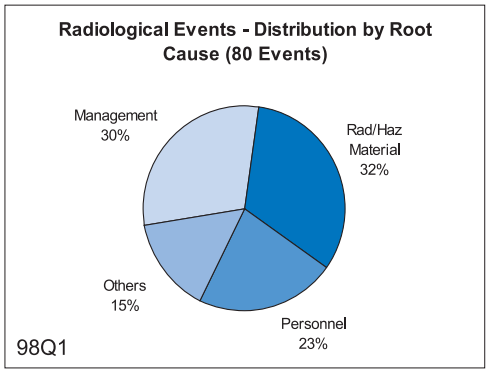
Distribution by Site

- Since Project Hanford Management Company (PHMC) assumed its responsibility as the integrating contractor at Hanford in October 1996, PHMC has averaged 15 contamination events through 98Q1. In 98Q2, PHMC reduced its number of contamination events to eight.

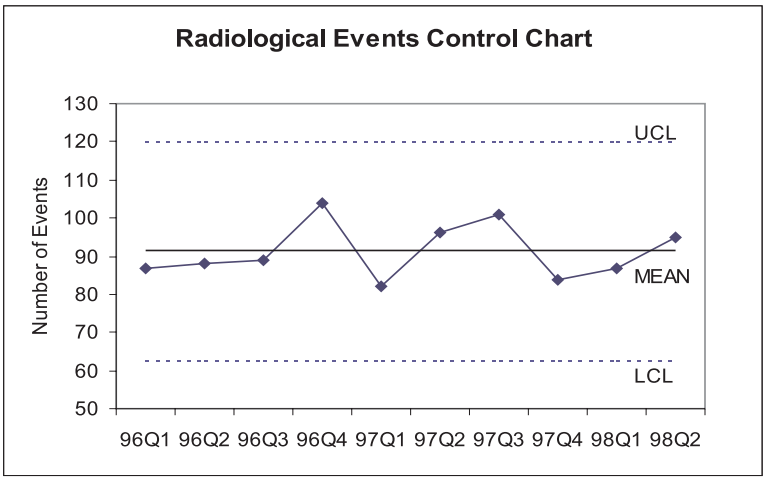


Distribution by Root Cause

- Of the 87 radiological events reported in 98Q1, 80 had a root cause analysis at the time of this report.



Statistical Process Control (SPC) Analysis



- The data are within the control limits of the process.

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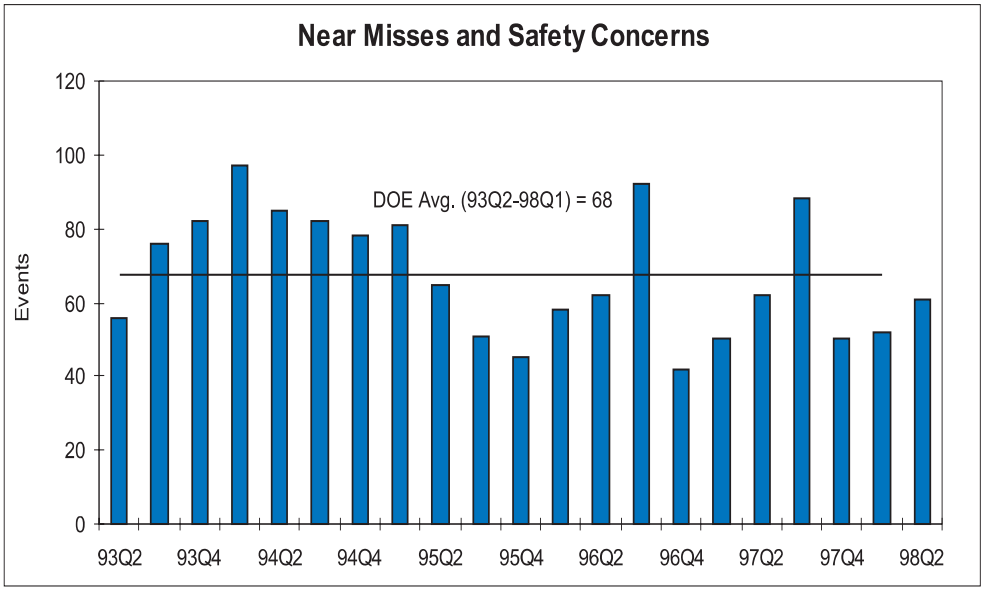
Indicator

12. Near Misses and Safety Concerns

Definition

A near miss is an operational event where barriers to an accident have been compromised such that no barriers or only one barrier remain (e.g., lack of fall protection, electric shock without injury, unauthorized confined space entry). A safety concern includes: the unauthorized use of hazardous products or processes, or when work is shut down as a result of an OSHA violation. Near misses and safety concerns are reportable under DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.



Source: Review of Occurrence Reports by Department Analysts.

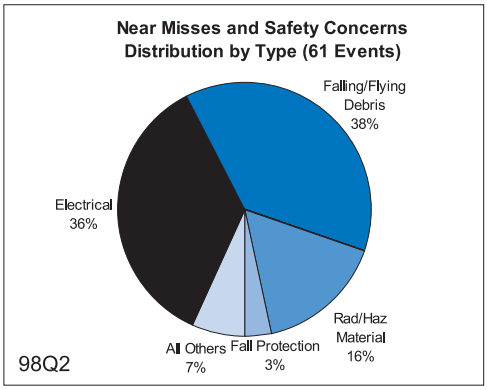
Key Observations

- Near miss and safety concern events continue to increase since 97Q3. Indications are that a 4-quarter cyclical trend is developing beginning with 95Q4.
- Twelve injuries occurred from these 61 events with the severity ranging from minor scrapes to third degree burns. Serious injuries included second and third degree flash burns, lacerated head wounds, skin infection following acid burns, and sprained arms and legs.

Additional Analysis

Distribution by Type of Hazard

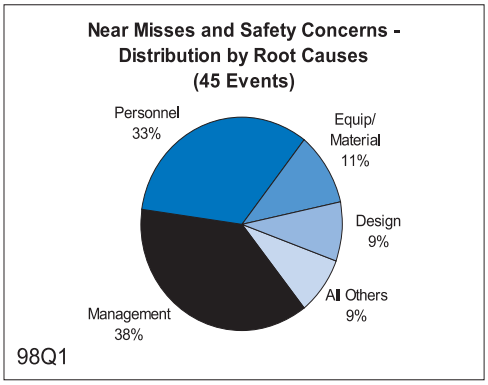
- Electrical components and Falling/ Flying Debris were responsible for the majority (74%) of the near misses and safety concerns events. Falling and Flying Debris (38%) became the most significant hazard for the first time.



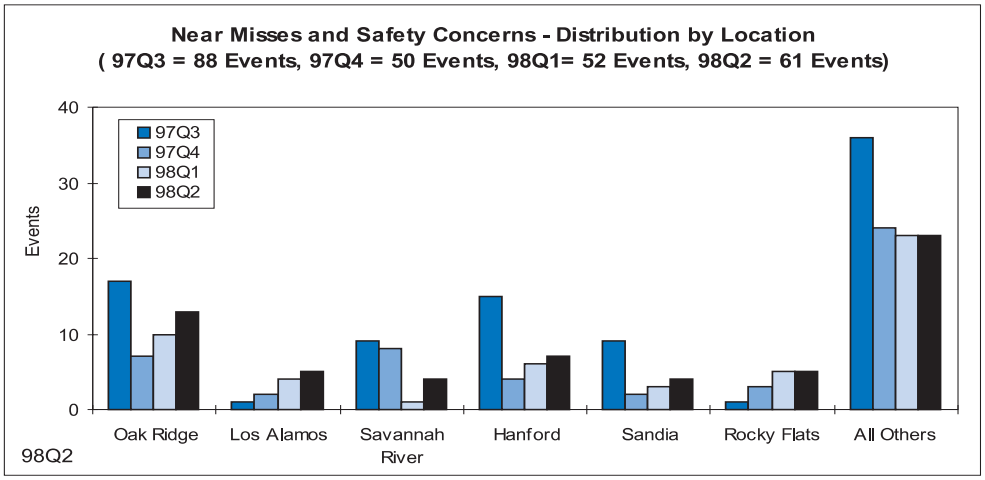
- The predominant causes for Falling and Flying Debris were similar to those in 98Q1: personnel not paying attention to the activity at-hand, equipment and material failures causing objects to fall or the generation of projectiles, and work planning deficiencies.
- Falling/Flying Debris was the leading cause for nine of the twelve reported injuries.
- Only 8 of 61 events involved decontamination and decommissioning activities. Three of these eight resulted in minor injuries.

Distribution by Root Cause

- Management Problems and Personnel Errors continue to be the predominant causal factors for most events.
- Management problems were dominated by work planning deficiencies and inadequate administrative control of work activities.
- The predominant personnel error involved those with workers not paying attention to the task they were performing; whether it was actual physical work or in the planning of the work. This was consistent with previous quarters.



Distribution by Location



- Five of the six sites listed on the chart indicate increased numbers of reportable events from 97Q4 to 98Q1. In contrast, the other DOE sites remained constant from the previous quarter.

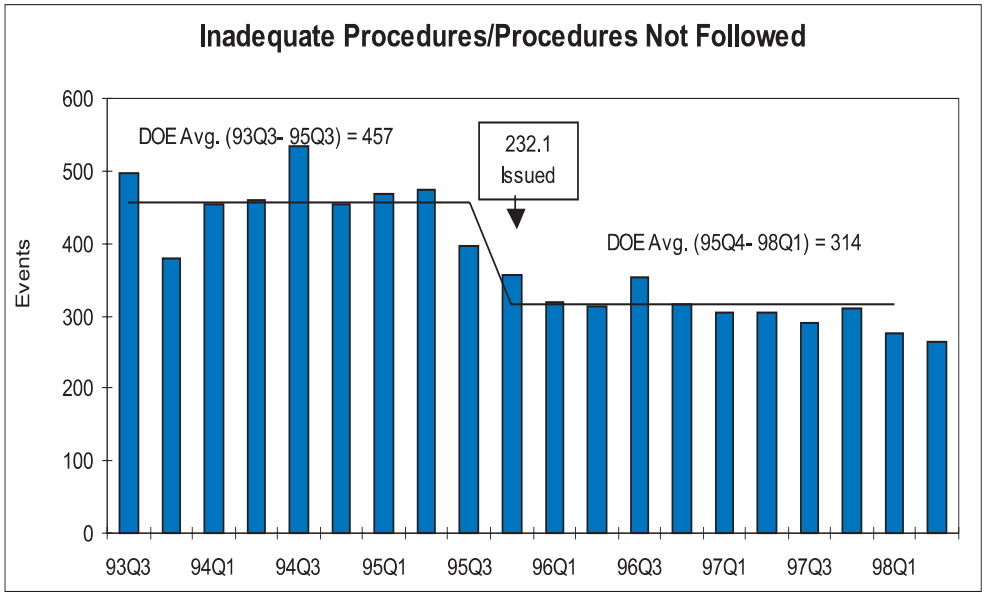
Additional Analysis

Indicator

13. Inadequate Procedures/Procedures Not Followed

Definition

Number of reportable events as defined in DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*, either categorized as procedure violations or problems, or reportable as being caused by a procedure violation or problem.



Source: Review of Occurrence Reports by Department Analysts.

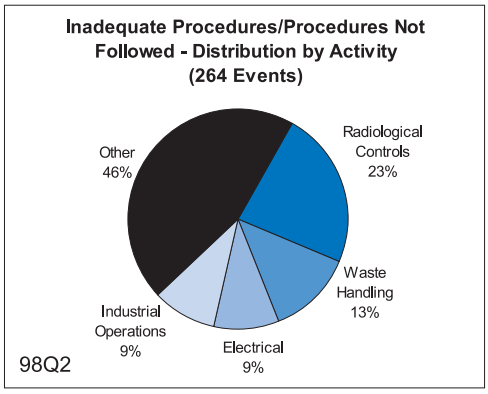
Key Observations

- The number of procedure related events has remained relatively stable since DOE Order 232.1A was issued.

Additional Analysis

Distribution by Activity

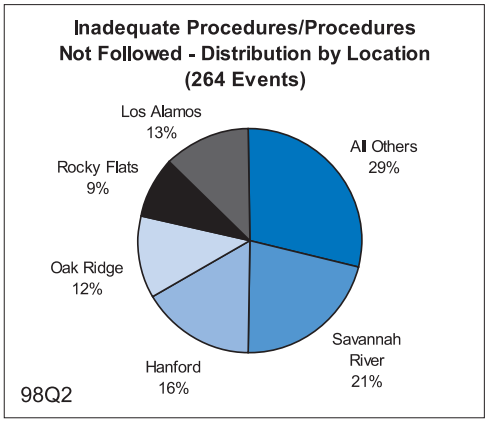
- Various activities were considered when characterizing the nature of the procedural problems. These included those related to: radiological controls, weapons/ explosives, emergency/abnormal response, waste handling, nuclear material handling, transportation, security, environmental compliance, electrical, industrial operations, fire protection, and administrative.
- When considering the largest contributor, radiological controls, the number of events in 98Q2 (61) did not change appreciably over the last quarter (62 events in 98Q1.)
- Of these radiological controls related events, the majority involved radiological posting or access controls. Other significant contributors were those events related to poor or ineffective individual work practices.



- The other largest contributing activities to this PI were those related to waste handling (storage, treatment and disposal), electrical support (maintenance, installation) and industrial operations (excavation, hoisting/rigging, forklift operations).

Distribution by Location

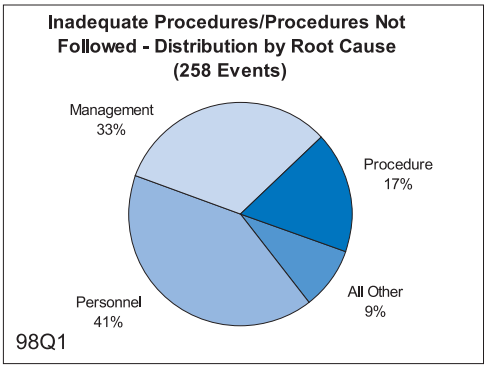
- As was the case last quarter, the 5 sites listed on the chart continue to have the largest number of events within the Department. This has also been the case consistently over the last 20 quarters.
- The 54 procedural related events at Savannah River primarily involved waste handling and administrative problems. These involved inadequate lockout/tagout documentation, inadvertent liquid waste transfers, and included mispositioned tank probes, among others.



- For the second largest contributor, Hanford, nearly 40 % of the reported events were related to radiological controls procedure problems. This is down slightly from last quarter when 46% of Hanford's events were related to radiological controls.
- Of the other three primary contributors, only Oak Ridge showed an appreciable change over last quarter's numbers. In this case, Oak Ridge showed an increase of over 50% (21 in 98Q1 and 32 in 98Q2.) The majority of these events occurred at Oak Ridge's X-10 and Y-12 sites and were related to electrical and radiological control procedure problems.

Distribution by Root Cause

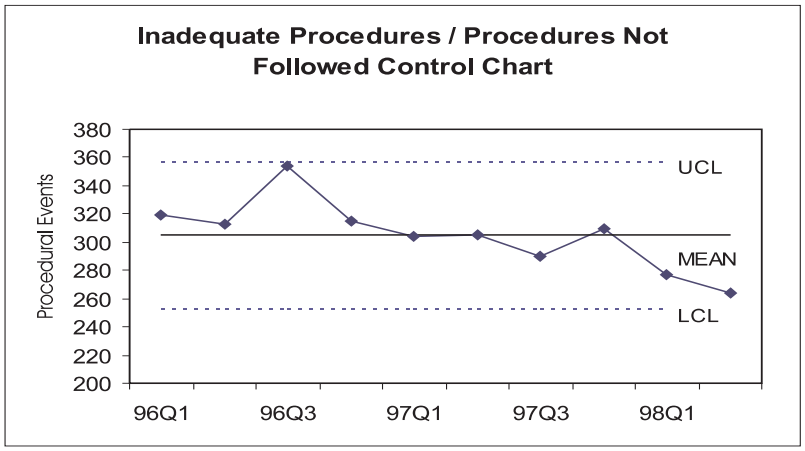
- Of the 277 total procedural related events reported in 98Q1, 258 had root causes assigned. Of these, the top 3 categories were personnel (106 events), management (84 events), and procedure (45 events.)
- Of the personnel errors cited, inattention to detail and procedures not used or used incorrectly were the most frequently determined specific causes. This was also the case in 97Q4 and, in fact, has consistently been the case over the last 20 quarters.



- The top three management root causes cited were: "Inadequate Administrative Controls", "Policy Not Adequately Defined, Disseminated, or Enforced", and "Work Organization/Planning Deficiency." This is consistent with 97Q4. However, of note is the fact that 98Q1 showed a substantial drop in the number of events (20 in 97Q4 and only 8 in 98Q1) in which "Other Management Problem" was cited as the root cause, compared to previous quarters.

- The most frequently cited procedural root cause was defective or inadequate procedure. This has also been the case over the last 20 quarters.

Statistical Process Control (SPC) Analysis



- The 98Q2 data point is expected to increase due to further identification of event root causes in 98Q3.

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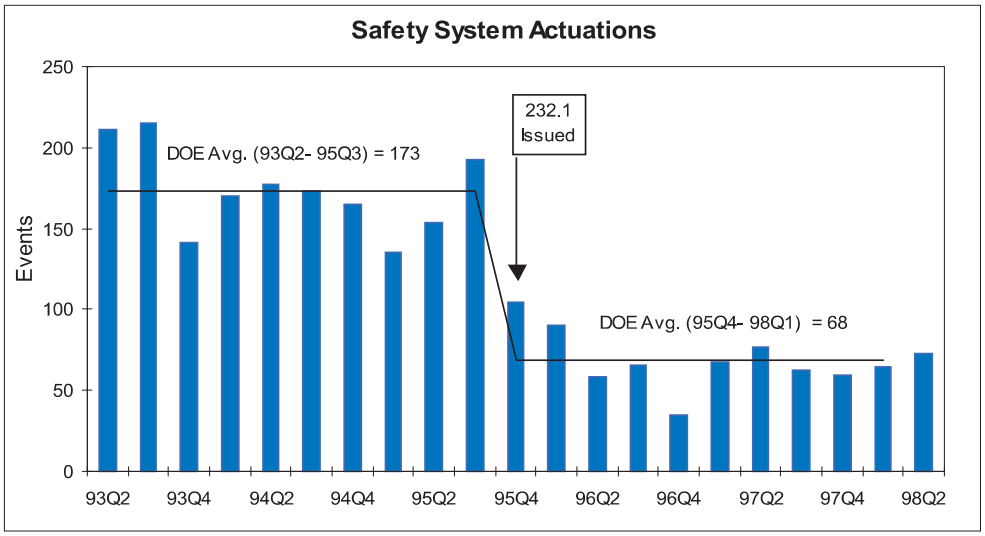
Indicator

14. Safety System Actuations

Definition

Number of operations-related events determined to be safety system actuations reportable under DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*. This includes real actuations of any safety-class equipment or alarm, unplanned electrical outages, unplanned outages of service systems, serious disruptions of facility activity related to weather phenomena, facility evacuations, or losses of process ventilation. These events have the potential to impact the safety and health of workers in the vicinity.



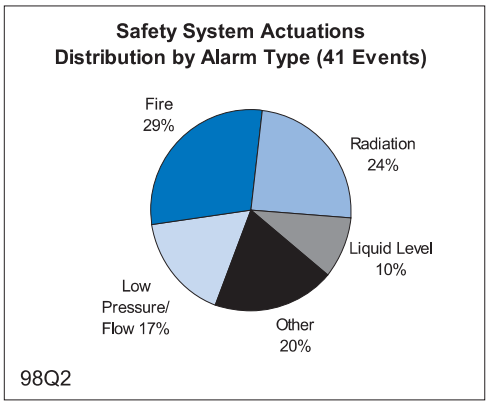
Source: Review of Occurrence Reports by Department Analysts.

Key Observations

- The number of safety system actuation events reported in 98Q2 (73) is slightly higher than the average number of actuation events (68) reported since implementation of DOE O 232.1 in 95Q4.
- In 98Q2, there were an unusual number of events (three) that were categorized as “emergency,” which requires activation of the Emergency Operations Center. Two of the events where at the Rocky Flats Environmental Technology Site: one involved a two gallon spill of radiologically contaminated phosphoric acid and the other involved a suspected leak from a Low-Level waste crate. The third event took place at Los Alamos National Laboratory where gasoline vapors were detected at TA-55, a plutonium handling facility. No personnel injuries or illnesses were reported as a result of these events.

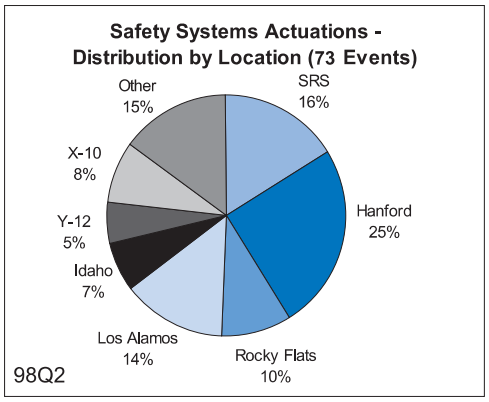
Distribution by Alarm System

- Of the 73 safety system actuations reported in 98Q2, 41 involved conditions that warranted actuation of alarms.
- System failures also constituted a portion of the safety system actuations reported in 98Q2. The failures were associated with two key systems; process ventilation (14) and electrical (19). The number of electrical system failures increased significantly when compared to the average of 8 over the previous three quarters.
- Weather phenomenon was a factor in 2 of the reported safety system actuations in 98Q2.
- In 98Q2, there were 4 unplanned reactor shutdowns. Three were at the High Flux Isotope Reactor due to tornado warnings and a minor earthquake. The fourth shutdown was at the Advanced Test Reactor due to powering up and rebooting of the Surveillance and Test System computer.



Distribution by Location

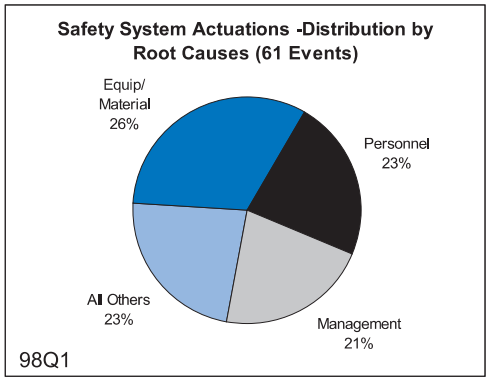
- The safety system actuation events reported in 98Q2 were analyzed as to the location where the actuation occurred. No significant change occurred in the distribution between quarters.



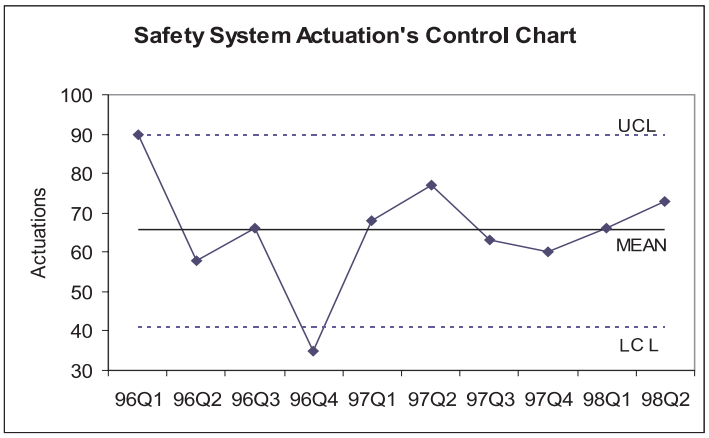
Additional Analysis

Distribution by Root Cause

- Design problems have typically been one of the leading root causes for safety system actuation events. However, in 98Q1 design problems were identified as the root cause in only 7% of the events as compared to 17% in the previous 8 quarters.



Statistical Process Control (SPC) Analysis



- The data point for 96Q4 is treated as an outlier as a known special cause exists. All other data points are within statistical control for the process.

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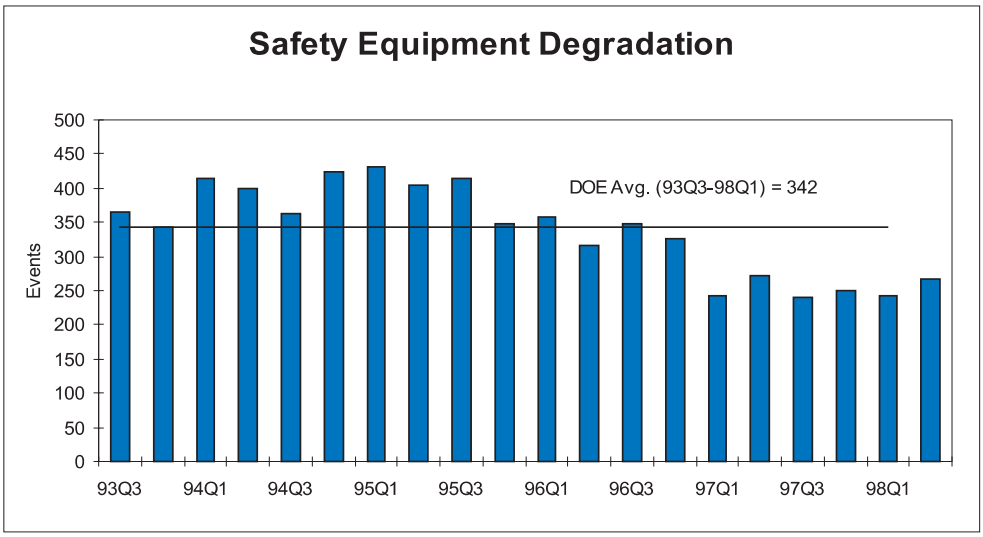
Indicator

15. Safety Equipment Degradation

Definition

Number of reportable events categorized as "vital system/component degradation" as defined in DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.

Safety equipment degradation includes: (1) any unplanned occurrence that results in the safety status or the authorization basis of a facility or process being seriously degraded; or (2) a deficiency such that a structure, system, or component (SSC) vital to safety or program performance does not conform to stated criteria and cannot perform its intended function; or (3) unsatisfactory surveillances/inspections and appraisal findings of any safety SSC.



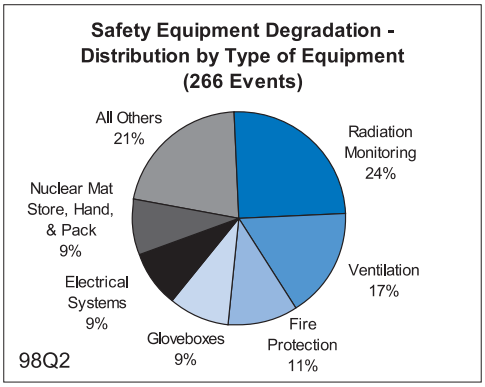
Source: Review of Occurrence Reports by Department Analysts.

Key Observations

- Although the number of events in 98Q2 remains well below the DOE Average since 93Q3, and the overall trend in the number of these events over the same time period is decreasing, the trend since 97Q1 appears to have stabilized.

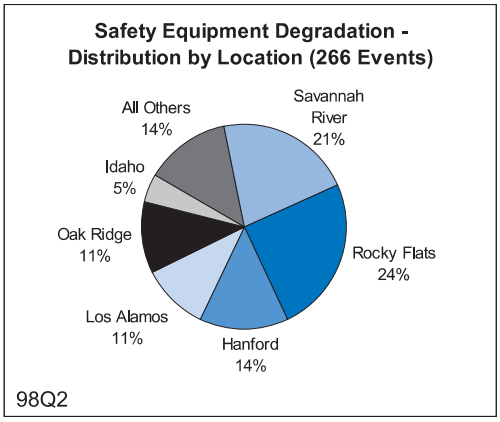
Distribution by Type of Equipment

- The major changes in the types of equipment degradation events since 98Q1 were the substantial rise in ventilation equipment-related events (44 in 98Q2 up from 26 in 98Q1) and the drop in the number of Nuclear Material Storage, Handling, and Packaging events (23 in 98Q2 down from 34 in 98Q1.) The remainder of events by equipment type remained stable.
- The number of degradation events for ventilation equipment was higher than the average of the 5 previous quarters (97Q1 – 98Q1 average was 33 events.) Of these, the single largest number of events (10) occurred at the Hanford tank farms and primarily involved loss of tank fans/exhausters.
- Radiological Monitoring continues to be the system most affected by equipment failures and has been since 97Q1. In this system, the major problem area was continuous airborne monitors (CAMs.) Another significant type of equipment affected by degraded components was those used to monitor criticality accidents/nuclear incidents.



Distribution by Location

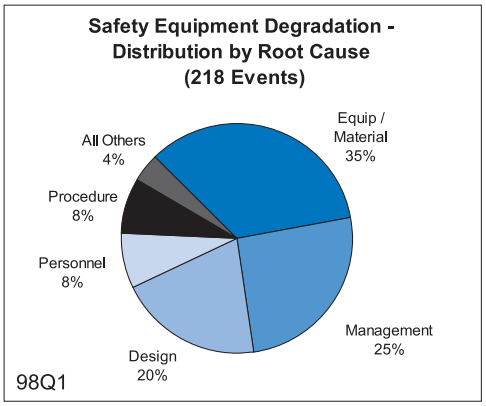
- The number of events at Rocky Flats increased 14% (66 events in 98Q2 up from 58 events in 98Q1.) The types of equipment affected were evenly distributed among radiation monitoring, ventilation, fire protection, and glovebox systems.
- Both Los Alamos National Laboratory and Oak Ridge experienced increases in the number of degradation events: 27% (28 events up from 22 events) and 43% (30 events up from 21 events), respectively. The single largest system affected at Los Alamos involved fire protection equipment while at Oak Ridge they were related to nuclear material storage and handling and miscellaneous electrical equipment.
- No single site showed any significant decrease in degradation events in 98Q2.



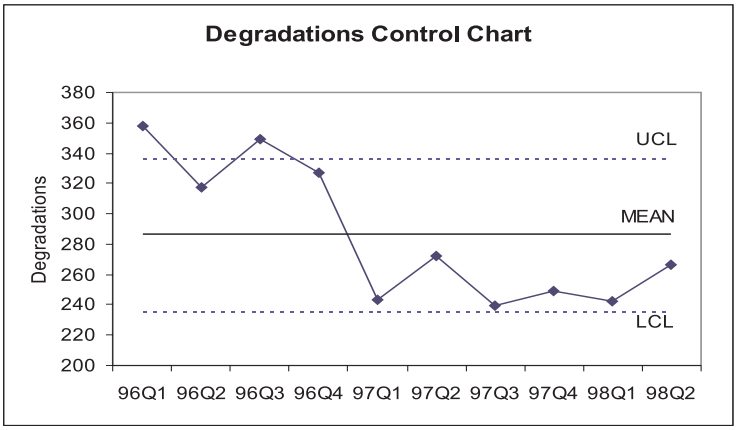
Additional Analysis

Distribution by Root Cause

- Of the 242 events reported in 98Q1, 218 (or 90%) had root causes established at the time that these analyses were performed.
- The root cause for 76 of the safety equipment degradation events was identified as equipment/material problems. Of these, the two most significant sub-categories were Defective or Failed Parts (46 events) and End of Life Failure (26 events.)
- The root cause for 55 safety equipment degradation events was a management problem. Of these, the most significant sub-categories of root cause were Inadequate Administrative Controls (19 events) and Policy Not Adequately Defined, Disseminated, or Enforced (18 events.)
- The root cause for 44 safety equipment degradation events involved design problems. Of these, the vast majority (27 events) involved Inattention to Detail.



Statistical Process Control (SPC) Analysis



- The process shift between 96Q3 and 96Q4 was due to the drop in reported degradation events at 2 of the Department's sites; Rocky Flats and Savannah River Site.
  - At Rocky Flats, the average number of events between 93Q3 and 96Q3 was 108 events, while the corresponding average from 96Q4 to 98Q2 was 77 events.
  - At Savannah River, the average for 93Q3 to 96Q3 was 112 events while the average for 96Q4 to 98Q2 was 55 events.

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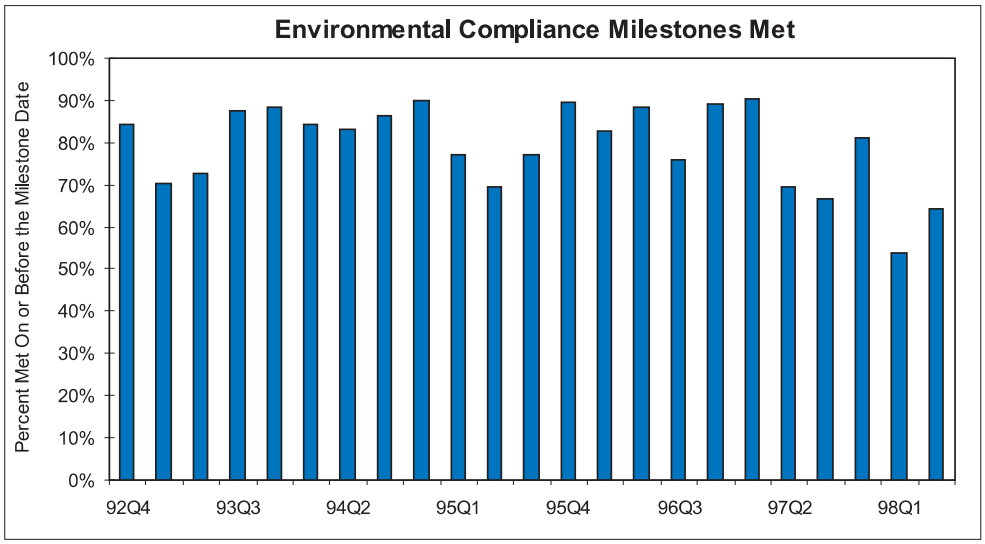
Indicator

16. Environmental Compliance Milestones Met

Definition

Enforceable requirements in environmental agreements met on or before the milestone date (percent).



Source: Office of Environmental Management; Progress Tracking System Data.

Key Observations

- An average of the most recent 5 quarters indicates DOE is missing an increasing number of enforceable compliance deadlines when compared to past performance. To date in fiscal year 1998, DOE has met only two-thirds of its enforceable milestones.

Additional Analysis

- In 98Q1 and 98Q2, DOE met only 54% and 64% of its enforceable milestones; significantly worse performance than most previous quarters.
- These data do not capture all enforceable milestones. They reflect only those milestones under the purview of the Office of Environmental Management. EM's Progress Tracking System is believed to capture 85-90 percent of all DOE enforceable environmental milestones.

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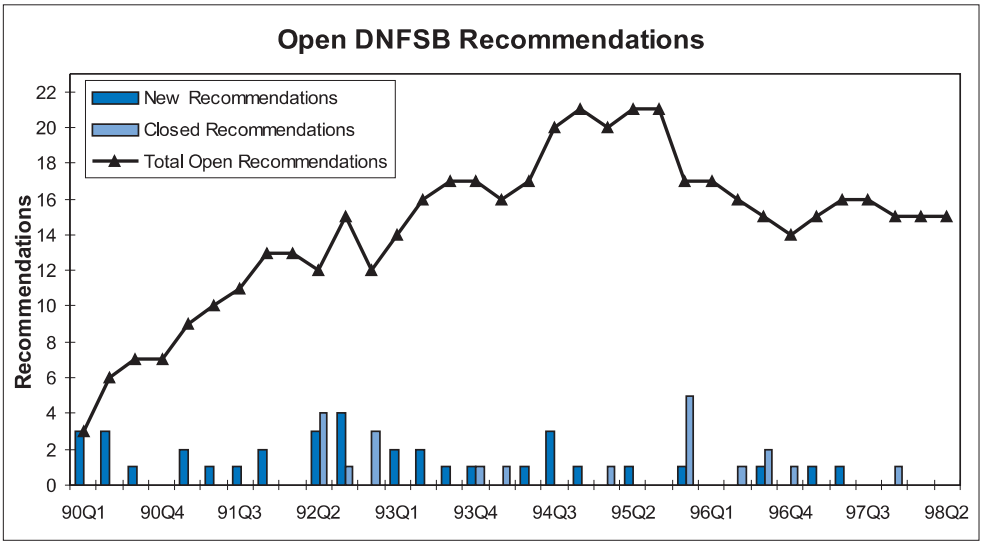
Indicator

17. Open DNFSB Recommendations

Definition

Cumulative number of open Defense Nuclear Facilities Safety Board (DNFSB) recommendations. DNFSB recommendations only apply to DOE defense nuclear facilities and, therefore, are representative only of DOE defense facilities.

Each DNFSB recommendation accepted by DOE leads to an implementation plan containing a set of commitments which, when fully implemented, will resolve the safety issues and lead to closure of the recommendation. A commitment is any documented obligation by the Secretary, or designee, that describes products to be delivered on a specified schedule. Commitments resulting from DNFSB recommendations are tracked by the Office of the Department Representative to the DNFSB (S-3.1) as completed (fulfilled), not yet due, and overdue.



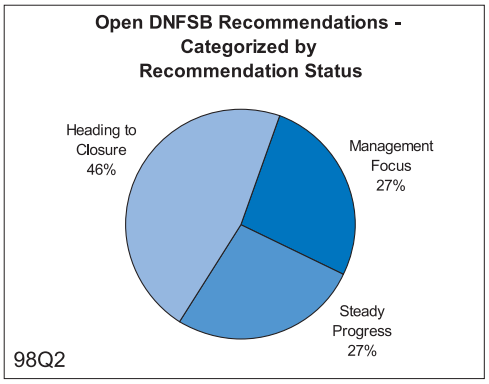
Source: Safety Issues Management System (SIMS)

Key Observations

- As of June 1998, there were 15 open DNFSB recommendations representing 640 DOE commitments. Of the 640 commitments, 376 (59 percent) were completed, 198 (31 percent) were open and not yet due, and 66 (10 percent) were open and overdue. A total of 24 commitments were completed over the past quarter.
- While 66 (10 percent) of the total open commitments were considered overdue, 37 (56 percent of the overdue commitments) were overdue by 3 months or longer. The Office of Human Resources and Administration and the Office of Environmental Management have responsibility for 52 (79 percent) of the 66 overdue commitments.

Characterization of Recommendation Status

- This graph shows an evaluation by S-3.1 on the number of open DNFSB recommendations categorized by recommendation status. A status of "Heading to Closure" includes the existence of a clearly defined path to closure, and the expectation that the remaining commitments/actions can be completed within the next year. "Steady Progress" implies the existence of an acceptable implementation plan with most commitments/deliverables generally being completed on schedule. Recommendations classified as "Management Focus" involve difficulties with (or lack of) an implementation plan or a large number (8) of overdue commitments.



  - During this quarter, one recommendation, 94-2 (Low Level Waste), was added to the Management Focus list, due to the number of overdue commitments, bringing the total to four recommendations.
  - The revised 93-3 implementation plan was accepted and approved by the DNFSB in May 1998 and by re-baselining the associated commitments, contributes to accounts for the slight decrease in overdue commitments (71 to 66).
  - The Office of Environmental Management is working on a comprehensive revision to the 94-1 implementation plan, currently targeted for completion in December 1998.
  - The current marked increase in overdue commitments associated with Rec. 94-2 (Low-Level Waste) is the result of a shift in EM management focus to higher priority issues. EM submitted a revised commitment schedule for 94-2 to the DNFSB on July 9, 1998.
  - Office of Environmental Management and Savannah River Site personnel are evaluating alternatives for the treatment of high-level waste, and plan to propose closure of Rec. 96-1 (In-Tank Precipitation Facility) in the near future.

Additional Analysis

Distribution of Open Commitments

Office	DNFSB Recommendations	Total Commitments	Complete		Not Yet Due		Overdue		Open	
EM	7	407	257	63%	109	27%	41	10%	150	37%
DP	4	130	95	73%	26	20%	9	7%	35	27%
EH	2	21	15	71%	1	5%	5	24%	6	29%
HR	1	75	2	3%	62	82%	11	15%	73	97%
NE	1	7	7	100%	0	0%	0	0%	0	0%
DOE	15	640	376	59%	198	10%	66	10%	264	41%

NOTE: % is percentage of total commitments for that office.

- The table above provides an overview of the status of DNFSB recommendations and commitments. The following four recommendations have 48 (73 percent) of the 66 overdue commitments and are on the Management Focus list: Rec. 93-3 (Improving Technical Capability), Rec. 94-1 (Improved Schedule for Remediation), Rec. 94-2 (Low-Level Waste), and Rec. 97-2 (Continuation of Criticality Safety).
- There continues to be a slight upward trend in the number of open commitments since the end of June 1997, where there were 217 open commitments. The current quarter ended with 264 open commitments. The Office of Environmental Management had the largest number of open commitments at 150.
- The total number of overdue commitments reached its highest level in April 1998 (76) and subsequently dropped when the revised implementation plan for Rec. 93-3 was issued in May 1998.
- Two recommendations have 100 percent of their associated commitments complete: Rec. 93-6 (Maintaining Access to Nuclear Weapons Expertise) and Rec. 95-1 (Cylinders Containing Depleted Uranium). One other recommendation was over 90 percent complete, Rec. 93-1 (Standards Utilization in Defense Nuclear Facilities). The Department proposed and is waiting closure of Rec. 93-6 (December 1996) and Rec. 95-1 (June 1997).

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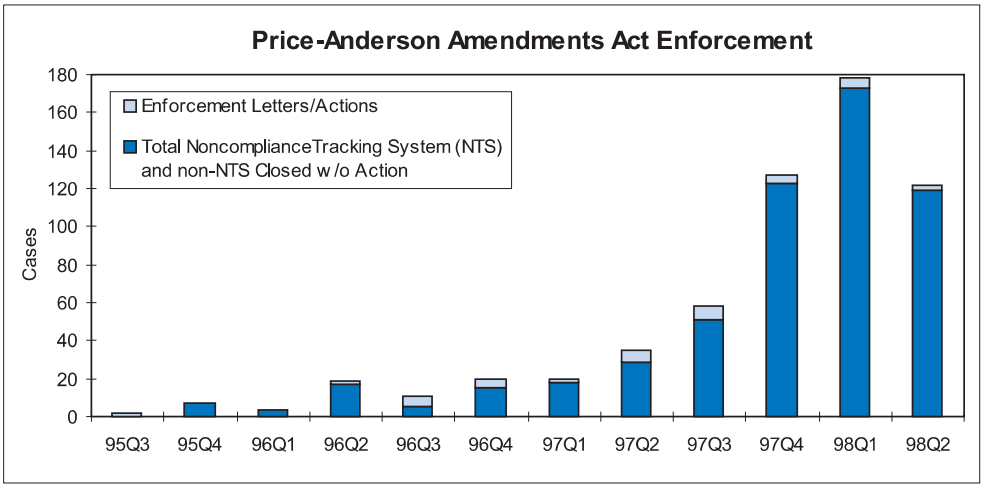
Indicator

18. Price-Anderson Amendments Act Enforcement

Definition

Total number of cases the Price-Anderson Amendments Act[a] (PAAA) Enforcement Office reviews per quarter.



Source: Office of Enforcement and Investigation Database.

Key Observations

- The PAAA Enforcement Office reviewed 119 reports in 98Q2 and issued one Consent Order and two Preliminary Notices of Violation (PNOV).

Additional Analysis

- On April 14, 1998, DOE issued its first Consent Order Incorporating Agreement to Kaiser-Hill Company for $100,000. A Consent Order is an agreement between DOE and the contractor based on DOE's approval of Kaiser-Hill's aggressive internal investigation reports of three events that occurred at the Rocky Flats Environmental Technology Site between January 1996 and January 1998. In a Consent Order Agreement, DOE does not conduct its own investigation and the fine is an agreed-to amount.
- On June 4, 1998, a PNOV with a Civil Penalty of $125,000 was issued to Lockheed Martin Idaho Technologies Company (LMITCO) for circumstances concerning the release of radioactive material at the Idaho National Engineering and Environmental Laboratory (INEEL).
- On June 4, 1998, a PNOV with a Civil Penalty of $25,000 was issued to the company MAC Isotopes, L.L.C., a subcontractor for LMITCO, for the same incident involving the release of radioactive material at INEEL.
- Of the 119 cases reviewed and closed without action by the PAAA Enforcement Office in 98Q2, 31 (26%) were self-identified by responsible contractors via the Noncompliance Tracking System and 88 (74%) were identified independently by the PAAA Enforcement Office. This compares to only 8% self-identified cases in 98Q1.

[a] 10CFR Parts 830.120, 835, 820.11.

- There were 54 new noncompliance reports entered in the Noncompliance Tracking System in 98Q2.
- The new graphical user interface version of the Noncompliance Tracking System went operational on June 8, 1998. The new system provides a vehicle for easier reporting by contractors.

Indicator

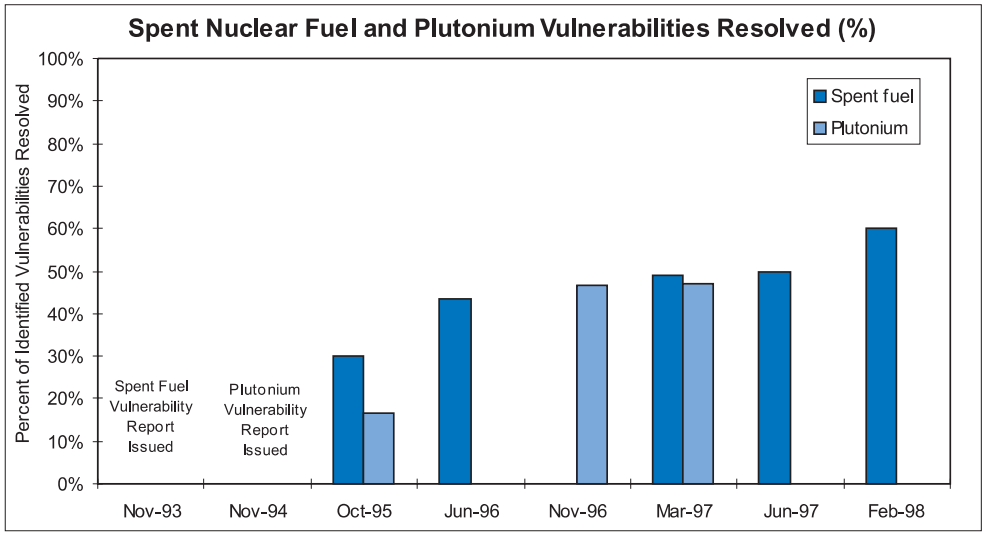
19. Spent Nuclear Fuel and Plutonium Vulnerabilities Resolved

Definition

Number of resolved plutonium and spent fuel vulnerabilities divided by the total number of vulnerabilities as defined in *Spent Fuel Working Group Report on Inventory and Storage of the Department's Spent Nuclear Fuel…and Their Environmental, Safety, and Health Vulnerabilities*, Volume 1, November 1993, and *Plutonium Working Group Report on Environmental, Safety, and Health Vulnerabilities*, Volume 1, November 1994 (DOE/EH-0415).

No change to this section since last report.

An ES&H vulnerability is defined in the plutonium and spent fuel vulnerability reports as "conditions or weaknesses that could lead to unnecessary or increased radiation exposure of workers, release of radioactive material to the environment or radiation exposure to the public." A resolved vulnerability implies that the cited condition no longer exists, the risk has been minimized to an acceptable level, or the risk has been evaluated at an active facility and judged to be acceptable. Vulnerabilities can be characterized as material/packaging (e.g., storage of unstable and corrosive solutions), facility condition (e.g., facility weakness), or institutional (e.g., loss of experienced personnel) vulnerabilities. The vulnerabilities were ranked by significance based on the likelihood of an accident and the perceived consequences.



Source: EM-66, Draft Plutonium Vulnerability Management Summary Report; EM-67, Report on Status of Corrective Actions to Resolve Spent Nuclear Fuel Vulnerabilities.

Key Observations

- There were 299 plutonium vulnerabilities identified at 13 sites and 106 spent nuclear fuel vulnerabilities identified at 8 sites based on reports issued in 1993 and 1994.
- The most spent nuclear fuel vulnerabilities (34 percent) were identified at Hanford, which currently maintains 86 percent of the DOE total spent nuclear fuel inventory by weight.

Additional Analysis

- There were 536 identified corrective actions for the 106 spent nuclear fuel vulnerabilities. Of these 536 corrective actions, 432 (81 percent) have been completed.

Table 1

Spent Nuclear Fuel Site	Vulnerabilities Identified	Vulnerabilities Resolved	Percent Resolved
Hanford	36	23	64%
Idaho	33	11	33%
Savannah River	21	19	90%
All Others	16	11	69%
Total	**106**	**64**	**60%**

- The table above (Table 1) indicates the breakdown of spent nuclear fuel vulnerabilities as of 97Q2 by location and the progress in resolving the identified vulnerabilities.

Table 2

Plutonium Site	Vulnerabilities Identified	Vulnerabilities Resolved	Percent Resolved
Rocky Flats	87	33	38%
Los Alamos	60	41	68%
Savannah River	40	10	25%
Hanford	34	9	26%
All Others	78	47	60%
Total	**299**	**140**	**47%**

Vulnerability resolution status has been updated for this report from the Draft Plutonium Working Group dated March 1997.

- The most plutonium vulnerabilities (87) were identified at Rocky Flats, which maintains 80 percent of the DOE total plutonium inventory by weight. Of these 87 vulnerabilities, 15 have been eliminated and an additional 18 have had the risk reduced to an acceptable level.
- Los Alamos had similar results in closing plutonium vulnerabilities with 14 vulnerabilities eliminated and the risk in 27 other issues reduced to an acceptable level.
- Fifteen of the top 46 highest risk plutonium vulnerabilities, DOE-wide, have been resolved. Seven of the highest plutonium vulnerabilities were eliminated; the risk for 8 other vulnerabilities has been reduced to an acceptable level.
- The above table (Table 2) indicates the breakdown of plutonium vulnerabilities as of 97Q1 by location and the progress of resolving the identified vulnerabilities.

Indicator

20. HEU Vulnerabilities Resolved

Definition

Percentage of vulnerabilities identified in the *Highly Enriched Uranium Working Group Report on Environmental, Safety and Health Vulnerabilities Associated with the Department's Storage of Highly Enriched Uranium* (DOE/EH-0525) that have been resolved.

An ES&H vulnerability is defined in the HEU Working Group Report as "conditions or weaknesses that could result in the exposure of workers or the public to radiation, or in releases of radioactive materials to the environment."

This indicator will be used to measure the progress in resolving the total of 155 ES&H vulnerabilities found in the assessment, and also specific subsets of these vulnerabilities: 1) the facility and material condition vulnerabilities ranked by the HEU Working Group as being of highest significance, 2) vulnerabilities at specific sites, and 3) vulnerabilities involving U-233.

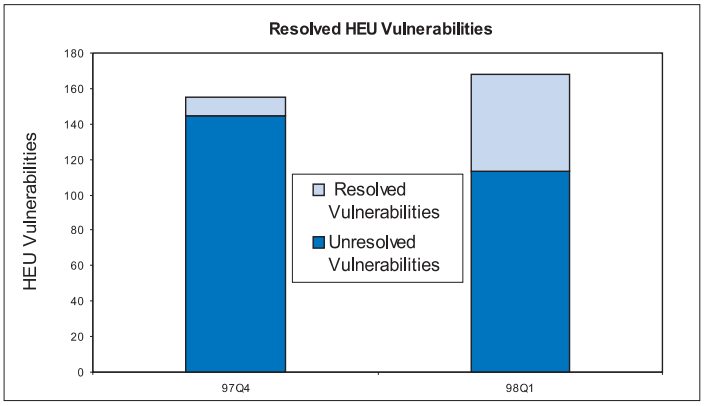
A significant fraction of the HEU Working Group's assessment involved U-233, stemming from this isotope's particular radiological properties (and those of U-232 co-produced with U-233). The HEU Working Group concluded that a special management plan is needed for safe interim storage of U-233 materials. Thus, U-233 vulnerabilities will be tracked as a separate group, even though this will involve "double counting" of some vulnerabilities ranked as having the highest significance and/or grouped in the "Total, DOE-wide" category.

Key Observations

HEU Vulnerablity Set	Vulnerabilities Identified	Vulnerabilities Resolved	P.I.= % Resolved
Total, DOE-Wide	155	55	33%
Highest Significance	21	5	24%
U-233 Vulnerabilities	14	2	15%

The table above summarizes the Department-wide status of HEU vulnerability resolution including the subsets of Highest Significance and U-233 Vulnerabilities:

- Fifty-five HEU vulnerabilities were resolved through 98Q1 as part of the DNFSB Recommendation 97-1 Implementation Plan actions, the HEU Vulnerability Management Plan, and/or Site-Specific HEU Management Plans.



The following table summarizes vulnerabilities on a site basis for 98Q1. Note that Oak Ridge Y-12 Plant stores a far greater amount of HEU (greater than 189 metric tons) than any other site. Also note that Oak Ridge National Laboratory and Idaho National Environmental Engineering Laboratory have the largest quantities of U-233 as shown in parentheses (424 and 351.6 kilograms, respectively). Actual inventories of U-233 are classified in cases where exact amounts are not shown.

HEU Site	HEU Inventory*	Vulnerabilities Identified	Vulnerabilities Resolved	P.I.= % Resolved
Oak Ridge Y-12 Plant	>189.0	49	13	24%
Rock Flats Env. Tech Site	6.7	28	8	26%
Los Alamos National Lab	3.2 (>1.0)	19	2	11%
Portsmouth Gaseous Diffusion Plant	22.0	16	7	39%
Idaho Nat. Engineering & Environmental Lab	>1.0 (351.6)	10	9	75%
Savannah River Site	13.8	9	4	44%
Oak Ridge K-25 Site	1.5	9	5	56%
Oak Ridge National Lab	1.2 (424.0)	6	1	17%
Pantex Plant	16.7**	5	3	60%
Sandia National Laboratories	<1.0	1	——	—
Argonne National Lab-West	<10.0	1	1	100%
Lawrence Livermore National Lab	<1.0 (3.1)	1	——	—
New Brunswick Laboratory	<1.0	1	1	100%

* Inventory of HEU produced in metric tons and U-233 in kilograms (shown in parentheses).

**Includes planned dismantlement.

Additional Analysis

- Led by the Office of Defense Programs (DP), DOE developed the HEU Vulnerability Management Plan, issued on June 13, 1997 by DP-1, that outlines a process for corrective actions and resolution of the HEU vulnerabilities. DP will track the resolution of the HEU vulnerabilities and report these either by a separate quarterly status report, or by information included in status reports that combine HEU vulnerability resolution with those for plutonium and/or spent nuclear fuel vulnerabilities. Moreover, the HEU Vulnerability Management Plan sets dates for resolution of the rest of the 16 HEU vulnerabilities (five have been resolved) designated by the HEU Working Group as being the highest significance. Thus, tracking of the PIs for these vulnerabilities can be shown against scheduled completion dates.
- The resolution of the other 100 HEU vulnerabilities identified in the HEU Vulnerability Assessment will depend on site-specific plans. Because of the need to work with separate Field Offices, scheduling and tracking of PIs concerning the other 100 vulnerabilities will take more effort and time to perform than those explicitly covered in the HEU Management Plan.

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Indicator

21. Waste Generation

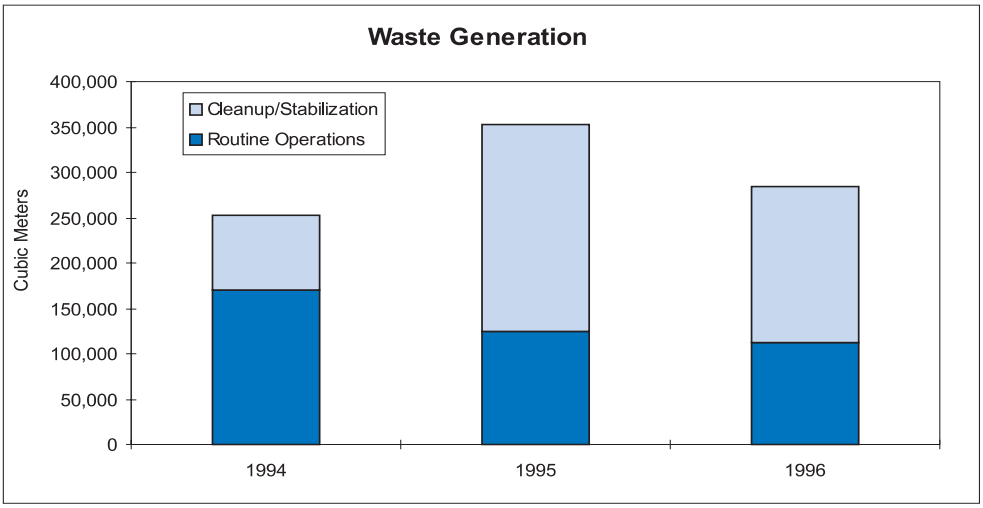
Definition

Total amount of waste generated, in cubic meters, for all DOE sites. Waste types generated include High-Level Radioactive, Transuranic, Low-Level Radioactive, Low-Level Mixed, Hazardous, and Sanitary. These waste types are generated during routine operations or cleanup/stabilization activities.

No change to this section since last report.

Routine operations waste consists of normal operation waste produced by any type of production operation; analytical and/or research and development laboratory operations, treatment, storage and disposal operations; "work for others"; or any other periodic or recurring work that is considered ongoing in nature.

Cleanup/stabilization waste, including primary and secondary waste, is generated by the environmental restoration of contaminated media (soil, groundwater, surface water, sediments, etc.), stabilization of nuclear and nonnuclear (chemical) materials, and deactivation and decommissioning of facilities.



Source: *Annual Report of Waste Generation and Pollution Prevention Progress 1996, August 1997, Office of Pollution Prevention, Office of Environmental Management.*

Key Observations

- The overall amount of waste generated decreased from 345,279 cubic meters to 283,948 cubic meters from 1995 to 1996. The amount of waste generated during routine operations (excluding sanitary) decreased 27 percent (from 30,164 cubic meters to 22,544 cubic meters), and the amount of waste generated during cleanup/stabilization operations (excluding sanitary) decreased 15 percent (from 114,201 cubic meters to 97,208 cubic meters). During the same period, the sanitary waste generated during routine operations decreased 9 percent (from 97,797 cubic meters to 89,038 cubic meters), and the amount of sanitary waste generated during cleanup/stabilization operations decreased 27 percent (from 103,117 cubic meters to 75,158 cubic meters).
- According to one of the authors of the *Annual Report of Waste Generation and Pollution Prevention Progress 1996*, the decrease in routine operations waste generated could be attributed to the rigorous pollution prevention programs put in place by programs and operations that reduced the generation of new waste, and the decrease in cleanup/stabilization waste generated for 1996 could be attributed to a peak in funding and phasing of those activities.

The tables below subcategorize waste generation based on production source: routine or cleanup/stabilization activities.

Waste Generated During Routine Activities (Cubic Meters)

Waste Type	1994	1995	1996
High-Level Radioactive	2,071	2,496	2,670
Transuranic	546	336	302
Low-Level Radioactive	31,868	21,894	15,048
Low-Level Mixed	2,834	1,335	1,371
Hazardous	12,497	4,103	3,153
Sanitary	110,208	97,797	89,038

- From 1995 to 1996, waste generated during routine activities decreased by 10 percent for Transuranic Waste, 27 percent for Low-Level Radioactive Waste, and 25 percent for Hazardous Waste.

Waste Generated During Cleanup/Stabilization Activities (Cubic Meters)

Waste Type	1994	1995	1996
Transuranic	214	156	202
Low-Level Radioactive	42,603	86,848	64,968
Low-Level Mixed	14,035	4,518	2,137
Hazardous	8,900	22,679	29,901
Sanitary	16,010	103,117	75,158

- From 1995 to 1996, waste generated during cleanup/stabilization activities decreased 26 percent for Low-Level Radioactive Waste and 52 percent for Low-Level Mixed Waste.
- Sanitary Waste accounted for 42 percent of all waste generated in both 1995 and 1996.

Additional Analysis

The Secretary's Commitments to the President in EQ and ES&H (for FY98)

Environmental Quality (EQ) and Environment, Safety, and Health (ES&H) commitments as part of the Secretary of Energy's Performance Agreement with the President for Fiscal Year 1998 are summarized below.

More information related to the status of these commitments can be obtained from DOE's Office of Policy or via the World Wide Web at: http://www.doe.gov/policy/library/sol98/goals_eq.htm

Environmental Quality (FY98)

Aggressively clean up the environmental legacy of nuclear weapons and civilian nuclear research and development programs, minimize future waste generation, safely manage nuclear materials, and permanently dispose of the Nation's radioactive wastes.

Our Commitments

EQ1: Reduce the most serious risks from the environmental legacy of the U.S. nuclear weapons complex first.

EQ1-1 *Reducing Worker, Public, and Environmental Risks*

Identify and fund projects to reduce the most serious risks first and prevent further increases in relative risk at all sites. **(EM)** **(STATUS: AT RISK)**

Success will be measured in FY 1998 by:

- *Stabilizing and safely storing about 3.7 metric tons of heavy metal of spent nuclear fuel (SNF). [Note: SNF data excludes information that is controlled or classified.]*
- *Stabilizing approximately 20,000 kilograms of bulk plutonium residue and approximately 7,000 liters of plutonium solution, and safely storing stabilized material.*
- *Closing one high-level waste storage tank at the Savannah River Site.*

EQ2: Clean up as many as possible of the Department's 53 remaining contaminated geographic sites by 2006.

EQ2-1 *Accelerate and Complete Geographic Site Cleanup*

Clean up as many as possible of the Department's 53 remaining contaminated geographic sites by 2006. Accelerate and complete cleanup of 9 large geographic sites by 2006, including the Fernald Environmental Management Project, Mound Plant, Rocky Flats Environmental Technology Site, Portsmouth Gaseous Diffusion Plant, West Valley Site, Weldon Spring Site, Brookhaven National Laboratory, and Lawrence Livermore National Laboratory (Main Site and Site 300).

Cleanup 34 of the remaining 36 smaller geographic sites by 2006, including the Uranium Mill Tailings Remedial Action (UMTRA) Project.

Accelerate cleanup at the remaining 7 large sites (Hanford, Savannah River, Idaho, Oak Ridge Reservation, Los Alamos National Laboratory, Nevada Test Site, and Paducah) where overall completion will not be achieved by 2006, and ramp up disposal operations at the Waste Isolation Pilot Plant (WIPP) to facilitate this accelerated clean-up.

Remediation progress will be measured by completion of release sites (i.e., discrete areas of contamination) and facilities (i.e., contaminated structures) that will ultimately lead to the completion of the entire geographic site. **(EM)**
(STATUS: ON TRACK)

Success will be measured in FY 1998 by:

- *Completing remediation at 6 geographic sites. This will bring the total number of completed geographic sites to 66 out of a total of 113 contaminated geographic sites.*
- *Making progress on release site completion:*
  - *Completing about 575 release site assessments.*
  - *Completing about 280 release site cleanups. This will bring the number of completed release site cleanups to approximately 4,130 out of a total inventory of about 9,300 release sites.*
- *Making progress on facility decommissionings:*
  - *Completing about 90 facility decommissioning assessments.*
  - *Completing about 70 facility decommissionings. This will bring the number of completed facility decommissionings to approximately 520 out of a total inventory of about 2,950 facilities.*

EQ3: Safely and expeditiously dispose of waste generated by nuclear weapons and civilian nuclear research and development programs and make defense high-level radioactive wastes disposal-ready.

EQ3-1 *Opening the Waste Isolation Pilot Plant*

Declare the Waste Isolation Pilot Plant (WIPP) geologic repository open for disposal of transuranic wastes in May 1998 (subject to regulatory approval) and maximize timely shipment of waste from DOE sites. **(EM)** **(STATUS: AT RISK)**

Success will be measured in FY 1998 by shipping between 388 and 592 cubic meters of transuranic (TRU) waste to WIPP for disposal from three DOE sites (Los Alamos National Laboratory, Rocky Flats Environmental Technology Site, and Idaho National Engineering and Environmental Laboratory).

EQ3-2 *Making Disposal Ready and Disposing of Waste Generated During Past and Current DOE Activities*

Safely and expeditiously make disposal-ready and dispose of waste generated during past and current DOE activities. **(EM)** **(STATUS: ON TRACK)**

Success will be measured in FY 1998 by:

- *Disposing of about 4,000 cubic meters of mixed low-level waste (MLLW).*
- *Disposing of about 30,000 cubic meters of low-level waste (LLW).*
- *Producing 200 canisters of high-level waste (HLW) at the Defense Waste Processing Facility (DWPF) at the Savannah River Site.*
- *Producing approximately 88 canisters of HLW at the West Valley Demonstration Project.*

EQ-4 Prevent future pollution.

EQ4-1 *Preventing Future Pollution*

Incorporate pollution prevention, including waste minimization, recycling, and reuse of materials, into all DOE activities. **(EM, DP, NE, ER)** **(STATUS: ON TRACK)**

Success will be measured in FY 1998 by:

- *Reducing routine waste generation by 40 percent compared with 1993 waste generation rates. [Data for reporting will be available at the end of calendar year 1998]* **(EM)**
- *Reducing/avoiding the generation of radioactive, mixed, and hazardous wastes by about 4,000 cubic meters. [Data for reporting will be available at the end of calendar year 1998]* **(EM)**

EQ5: Dispose of high-level radioactive waste and spent nuclear fuel in accordance with the Nuclear Waste Policy Act as amended.

EQ5-1 *Continuing with Yucca Mountain Site Characterization*

Complete the scientific and technical analyses of the Yucca Mountain site, and if it is determined to be suitable for a geologic repository, obtain a license from the Nuclear Regulatory Commission. **(RW)**

Success will be measured in FY 1998 by completing the viability assessment analyses for licensing and constructing a geologic repository at the Yucca Mountain site. The assessment will consist of four key components:

- *A design and operational concept of the repository;*
- *An assessment of the performance of that concept in the geologic setting;*
- *A plan and cost estimate to construct and operate the repository; and*
- *A plan and an estimate of the costs to complete a license application.*

EQ5-2 *Developing Waste Acceptance and Transportation Capability*

Maintain the capability to respond to potential statutory direction that may include transportation of spent nuclear fuel and high-level waste to a designated interim storage facility. **(RW)** **(STATUS: ON TRACK)**

Success will be measured in FY 1998 by:

- *Completing generic, non-site-specific interim storage facility work and addressing long lead-time issues related to storage of waste including design, engineering, and safety analyses.*
- *Developing a market-driven approach that uses private sector management and operational capabilities to provide waste acceptance and transportation services. Issuing a revised draft request for proposals.*
- *Completing a revised Policy and Procedure for implementation of Section 180(c) of the Nuclear Waste Policy Act.*

EQ-6 Reduce the life-cycle costs of environmental cleanup.

EQ6-1 *Reducing Environmental Cleanup Costs through Enhanced Performance*

Significantly enhance performance, increase efficiency, and reduce costs through increased use of fixed-price competitive contracting, optimized project sequencing, recycling, and other waste minimization techniques, privatization, systems engineering, and benchmarking. **(EM)** **(STATUS: ON TRACK)**

Success will be measured in FY 1998 by

- *Achieving productivity enhancement targets (Targets to be established as part of the Accelerating Clean-up: Focus on 2006).*
- *Increasing the dollar value and/or number of competitively awarded fixed-price contracts, including privatization contracts. Continuing the development of the privatization strategy by:*
  - — *Awarding the Oak Ridge Transuranic Waste Treatment Privatization contract;*
  - — *Authorizing commencement of the Tank Waste Remediation System (TWRS) contract Phase 1B at Hanford Site in Washington; and*
  - — *Awarding the Carlsbad Area Office Contact-Handled Transuranic Waste Transportation Privatization Contract.*

EQ6-2 *Developing and Deploying Innovative Cleanup Technologies*

Develop and deploy innovative environmental cleanup, nuclear waste, and spent fuel treatment technologies that reduce cost, resolve currently intractable problems, and/or are more protective of workers and the environment. **(EM)** **(STATUS: ON TRACK)**

Success will be measured in FY 1998 by:

- *Accomplishing 49 innovative technology deployments.*
- *Demonstrating 35 alternative technology systems that meet the performance-specification based needs as identified by the Site Technology Coordinating Groups (STCGs).*
- *Making 40 alternative technology systems available for implementation with full cost and engineering performance data.*
- *Completing the final Programmatic Environmental Impact Statement for selecting the long-term management strategy for the depleted UF_6.* **(NE)**

EQ6-3 *Completing Deactivation of Surplus Facilities*

Reduce operating costs by completing deactivation of surplus facilities and placing them in a safe and environmentally sound condition, requiring minimal surveillance and maintenance. **(EM)** **(STATUS: ON TRACK)**

Success will be measured in FY 1998 by completing about 60 surplus facility deactivations.

EQ-7 Maximize the beneficial reuse of land and effectively control risks from residual contamination.

EQ7-1 *Making DOE Lands and Facilities Available for Other Uses*

In conjunction with stakeholders, develop comprehensive land use plans for DOE sites that provide information on alternative uses, ownership, environmental requirements, and implementation schedules. **(FM)** **(STATUS: AT RISK)**

Success will be measured in FY 1998 by:

- *Submitting to Congress a future use plan for DOE sites, and an analysis of related long-term stewardship issues by October 1998. The plan and analysis will include the Hanford Site, Savannah River Site, Rocky Flats Environmental Technology Site, and Idaho National Engineering and Environmental Laboratory.* **(EM)**
- *Initiating mission justification analysis and providing a schedule for reporting on the amount of excess land and facilities at each site by July 30, 1998.*

Environment, Safety, and Health

The mission of the Office of Environment, Safety, and Health is to develop innovative, unique, and cost-effective approaches for the protection of Department of Energy workers, the public, and the environment.

Our Commitments

CM1-1 *Instituting a Sound ES&H Culture*

Integrate and embed risk-based outcome oriented environment, safety, and health (ES&H) management practices into the performance of DOE's day-to-day work. **(EH)** **(STATUS: ON TRACK)**

Success will be measured in FY 1998 by:

- *Preventing fatalities, serious accidents, and environmental releases at Departmental sites.*
- *Initiating Integrated Safety Management Systems at all 10 high priority facilities by April 1998.*
- *Completing documentation of ES&H roles and responsibilities for all appropriate DOE offices and sites by July 1998.*
- *Publishing guidance for incorporating environmental justice principles into the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) implementation process. (EH/ED)*

- *Through independent oversight, provide information and analysis of the effectiveness, vulnerabilities, and trends of the Department's environment, safety, health, and safeguards and security policies and programs to the Secretary and senior line management*
- *Completing an additional four needs assessments to continue building the basis for a more detailed program of medical surveillance, in order to address the health risks to former DOE workers.*

CM1-2 *Ensuring DOE Programs Appropriately Address ES&H Priorities*

Clearly identify and fund ES&H priorities and ensure resources are appropriately spent on those priorities. **(EH)** **(STATUS: ON TRACK)**

Success will be measured in FY 1998 by beginning to annually monitor and report on ES&H expenditures and improve related internal controls.

CM1-4 *Investigating Feasibility of Independent External Oversight of Safety and Health at DOE Sites*

Work with the Nuclear Regulatory Commission and the Occupational Safety and Health Administration to evaluate the costs and benefits of independent external regulation of safety and health. **(EH)** **(STATUS: ON TRACK)**

Success will be measured in FY 1998 by conducting three NRC/DOE pilot projects to assess the DOE facilities against the standards that NRC believes would be appropriate to ensure radiological safety.

Relationship to DOE Strategic Plan Goals

Establish Priorities & Eliminate Hazards

Performance Requirements

DOE STRATEGIC PLAN (September 1997)	PERFORMANCE INDICATORS
DOE's Four Businesses: Environmental Quality *How we will reduce the environmental, safety, and health risks and threats from DOE facilities and materials, safely and permanently dispose of civilian spent nuclear fuel and defense related radioactive waste, and develop the technologies and institutions required for solving domestic and international environmental problems.* **Environmental Quality: Objective 3** *Safely and expeditiously dispose of waste generated by nuclear weapons and civilian nuclear research and development programs and make defense high-level radioactive waste disposal-ready*	1. Total Recordable Case Rate 2. Occupational Safety and Health Cost Index 3. Electrical Safety 4. Industrial Operations Safety 5. Chemical Hazard Events 6. Reportable Occurrences of Releases to the Environment 7. Cited Environmental Violations 8. Environmental Permit Exceedances 9. Radiation Dose to the Public 10. Worker Radiation Dose 11. Radiological Events 18. Price-Anderson Amendments Act Enforcement 19. Spent Nuclear Fuel and Plutonium Vulnerabilities Resolved 20. HEU Vulnerabilities Resolved 21. Waste Generation
Corporate Management: Environment, Safety, and Health *How we will ensure the safety and health of workers and the public, and protect and restore the environment.* **Corporate Management: Objective 1** *Ensure the safety and health of the DOE workforce and members of the public, and the protection of the environment in all Departmental activities.*	1. Total Recordable Case Rate 2. Occupational Safety and Health Cost Index 3. Electrical Safety 4. Industrial Operations Safety 7. Cited Environmental Violations 8. Environmental Permit Exceedances 9. Radiation Dose to the Public 10. Worker Radiation Dose 11. Radiological Events 12. Near Misses and Safety Concerns 13. Inadequate Procedures/Procedures Not Followed 16. Environmental Compliance Milestones Met 17. Open DNFSB Recommendations

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Summary of Process

B1. Overview

One of the critical success factors identified in the Department of Energy's (DOE) Strategic Plan for environment, safety and health is, "how will we ensure the safety and health of workers and the public, and protect and restore the environment." This report describes a new approach for measuring the performance of DOE operations in these areas and thereby supporting management decisions aimed at "ensuring the safety." The general concept is to focus on key factors with the most impact on worker and facility safety and the environment.

Data collection was limited to available data (e.g., ORPS, CAIRS, Site Environmental Reports). The process was non-intrusive and did not expend site resources. As such, the performance indicator components may not sufficiently measure all facets of environment, safety and health. Experience from this report, along with customer feedback from the attached survey form, will be evaluated.

This report was reviewed by a multi-disciplinary team with expertise in nuclear and facility safety, environment, worker safety and health, health studies, and planning/administration. The team is identified at the end of this appendix.

B1.1 Initial Performance Indicators

The performance indicators included in this report are identified in the following table. Selection of the indicators involved both evaluation of the overall safety significance as well as tests of availability. A process was established where all potential indicators were evaluated with respect to significance to the ultimate goal of measuring performance in environment, safety and health. With respect to availability, a decision was made to select indicators from existing data streams to avoid, for now, levying a burden on field activities for additional data. Primarily, indicators are derived from data within four data systems and one annual report:

- *Occurrence Reporting and Processing System (ORPS)*—A system originally designed for notification of nuclear as well as non-nuclear occurrences in the field. For all indicators based on occurrence reports, data prior to 93Q1 has been removed from the graphs and analysis.

- *Computerized Accident/Incident Reporting System (CAIRS)*—A system for collecting data associated with occupational injury and illness events and statistics.

- *Radiation Exposure Monitoring System (REMS)*—A system for collecting data on individual radiation doses received by DOE complex workers.

- *Environmental Compliance Database*—A system maintained by the Office of Environmental Policy and Assistance.

- *Annual Site Environmental Reports*

There are, of course, limitations resulting from using the data for other than the purpose for which it was collected. Furthermore, the availability of data should not be confused with relevance to measuring performance. Indicators should be selected based on their impact on the operations being examined, not solely because the data exist. Although some of the selected indicators may be of interest to other audiences, it is likely that other valid indicators exist that should be analyzed and trended to provide the appropriate perspective (e.g., facility, contractor, program management) on performance.

PI Component	Data Source
I. Accidents/Events	
1. Total Recordable Case Rate	Computerized Accident/Incident Reporting System/ EH-51
2. Occupational Safety and Health Cost Index	Computerized Accident/Incident Reporting System/ EH-51
3. Electrical Safety	Review of Occurrence Reports, EH-33 Field Office Contacts
4. Industrial Operations Safety	Review of Occurrence Reports, EH-33 Field Office Contacts
5. Chemical Hazard Events	Quarterly Review of Chemical Safety Concerns/ Occurrence Reporting and Processing System, EH-52/EH-53/BNL
6. Reportable Occurrences of Releases to the Environment	Review of Occurrence Reports, EH-33
7. Cited Environmental Violations	Environmental Compliance Tracking Database, EH-41
8. Environmental Permit Exceedances	Annual Site Environmental Reports, EH-41
9. Radiation Dose to the Public	Annual Reports to Environmental Protection Agency (EPA) by Each Site, EH-41
10. Worker Radiation Dose	Radiation Exposure Monitoring System (REMS), EH-52
11. Radiological Events	Review of Occurrence Reports, EH-33
II. Precursors	
12. Near Misses and Safety Concerns	Review of Occurrence Reports, EH-33
13. Inadequate Procedures/Procedures Not Followed	Review of Occurrence Reports, EH-33
14. Safety System Actuations	Review of Occurrence Reports, EH-33
15. Safety Equipment Degradation	Review of Occurrence Reports, EH-33, Field Office Contacts
III. ES&H Management	
16. Environmental Compliance Milestones Met	EM Progress Tracking System (PTS), EH-41
17. Open DNFSB Recommendations	Safety Issues Management System (SIMS), S-3.1
18. Price-Anderson Amendments Act Enforcement	Office of Enforcement and Investigation Database, EH-10
IV. Hazards	
19. Spent Nuclear Fuel and Plutonium Vulnerabilities Resolved	Plutonium Vulnerability Management Summary Report, EM-66; Reports on Status of Corrective Actions to Resolve Spent Nuclear Fuel Vulnerabilities, EM-67
20. HEU Vulnerabilities Resolved	Office of Site Operations, DP-24 Highly Enriched Uranium ES&H Vulnerabilities Status Report, RFFO Field Office Contacts
21. Waste Generation	Waste Minimization Reporting System, EH-41

B2. Data Analysis–Analyses Performed

The data analysis results are summarized in the DOE Performance Indicator Report. They are intended to identify areas which should be further investigated (to identify areas that may require intervention as well as good practices to share across DOE); they do not provide absolute answers in themselves. Data analyses include:

- Looking for statistically significant trends over time,
- Comparison to historical averages or benchmarks (e.g., Bureau of Labor Statistics for similar industries),
- Normalization of events to opportunities (e.g., construction related events divided by construction hours worked or construction dollars spent),
- Examination for statistically significant trends in types of operations, severity or type of events, and causes.

Typically, the historical baseline is established using existing data excluding the most recent quarter. Where possible, data were analyzed by quarter. In some cases, data were also viewed monthly to reveal any interesting seasonal effects not evident in the quarterly data grouping. Where appropriate, sites were contacted to provide perspective for unusual data values or trends. Data sources for several of these measures are annual; the need for more frequent data must be evaluated for future reports.

The data can also be used to perform other special analyses and reports (such as trends in causes and types of events). These analyses and reports could support special needs, such as oversight preparation and programmatic reviews. Root cause data is analyzed based on information from the preceding quater as there is an inherent time lag between event notification and final identification of a root cause. To capture the maximum number of root causes for analysis purposes, the preceding quarter is examined.

B3 – Significance Analysis

The application of significance ranking in the context of performance indicators can be used to aid DOE and contractor management in determining where they need to apply resources to mitigate hazards or to improve safety. It is anticipated that as experience is gained, significance ranking will be applied to other performance indicators.

Significance of events is assigned in accordance with Table 1, EH-33 Performance Indicator Significance Criteria, in Appendix B-3 of this report. The table was developed for use with the PI report with input from various significance ranking models, including Savannah River's Significance Categories Matrix, Hanford's Priority Planning Grid, and from limits provided by various DOE Orders.

There are four significance rankings – Level 1 through 4 – with Level 1 being the most significant and Level 4 the least. Generic criteria for areas such as worker and public safety are combined with PI-specific criteria (i.e., Electrical Safety) to rank the significance of events. For example, a minor event that would be ranked as Level 4 (least significant) under the generic criteria would, in accordance with the PI-specific criteria for Electrical Safety, be ranked as Level 3 if an electrical shock was involved. For cases where there is no PI-specific criteria, the generic criteria are used.

It is expected that more PI-specific criteria will be developed as experience is gained with the current system and based on feedback from readers of this report.

Table 1 - EH-33 Performance Indicator Significance Criteria

Worker Safety	Level 1	Level 2	Level 3	Level 4
	Loss of life			
	Permanent disability			
	Injury with >30 days of lost work time	Injury with hospitalization or lost work time	Injury requiring medical treatment	Minor injury - no treatment, no lost work days
Public Safety	**Level 1**	**Level 2**	**Level 3**	**Level 4**
	Offsite exposure near or above limits, moderate injuries	Low-level radiation or chemical exposure	Minor injury	Public inconvenience
Environmental	**Level 1**	**Level 2**	**Level 3**	**Level 4**
	Major on-site environmental damange with cleanup costs >$5M	On-site environmental damage with cleanup costs >$500K	On-site environmental damage with cleanup costs >$250K	Reportable release with minor or no impact
	Off-site environmental damage with significant cleanup costs	On-site environmental damage with minor cleanup costs	Release to environment that exceed regulatory limits	
Facility Safety	**Level 1**	**Level 2**	**Level 3**	**Level 4**
	Willful management disregard or direction to staff to disregard safety requirements, policies, or procedures	Widespread failure or lack of one or more facility safety programs	Findings indicating major deficiency or lack of compliance with safety documents	Administrative or isolated non-compliance
		Unreviewed Safety Question	OSR / Tech Spec violation	
		Major loss of configuration control in nuclear facility	Technical analysis cannot support conclusions needed for compliance document	
		DOE authorization required for startup or restart	Failure of corrective action to prevent recurrence	
External Compliance	**Level 1**	**Level 2**	**Level 3**	**Level 4**
	Willful violation of federal, state, or local laws or regulations	Several instances of non-compliance that indicate major deficiency or lack of a compliance program	Isolated or single noncompliance	Administrative or isolated non-compliance
Cost / Schedule	**Level 1**	**Level 2**	**Level 3**	**Level 4**
Cost	>$5M	>$1M	>$250K	>$100K
Schedule	Significant project delay		Minor project delay	Failure to meet milestone
Electrical Safety	**Level 1**	**Level 2**	**Level 3**	**Level 4**
			Electrical Shock, RF burn	
			Contact with energized equipment that should have been de-energized	

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Glossary

Baselines

Baselines provide an historical reference point used to show how the current period compares to past experience. Generally, historical baselines are established using existing data excluding the most recent reporting period. For the data that originates from CAIRS, the two most recent quarters are excluded to account for the lag in data reporting. Baselines established for data originating from occurrence reports are reevaluated each time the governing reporting order changes.

Causes of Occurrences

Causes of occurrences are determined by performing event investigations and may be identified as direct, contributing, or root causes.

- Direct Cause: The cause that directly resulted in the occurrence.
- Contributing Causes: The cause(s) that contributed to the occurrence, but by itself would not have caused the occurrence.
- Root Cause: The cause that, if corrected, would prevent recurrence of this and similar occurrences.

Cause categories are selected from the following:

1. Equipment/material problem: An event or condition resulting from the failure, malfunction, or deterioration of equipment or parts, including instruments or material.
2. Procedure problem: An event or condition that can be traced to the lack of a procedure, an error in a procedure, or procedural deficiency or inadequacy.
3. Personnel error: An event or condition due to an error, mistake or oversight. Personnel errors include inattention to details of the task, procedures not used or used incorrectly, communication problems, and other human errors.
4. Design problem: An event or condition that can be traced to a defect in design or other factors related to configuration, engineering, layout, tolerances, calculations, etc.
5. Training deficiency: An event or condition that can be traced to a lack of training or insufficient training to enable a person to perform a desired task adequately.
6. Management problem: An event or condition that can be directly traced to managerial actions or methods. Management problems include inadequate administrative control, work organization/planning deficiency, inadequate supervision, improper resource allocation, policies not adequately defined, disseminated or enforced,

Facility Function

Facility function identifies the type of facility or the activity/function performed by the facility. Possible facility functions are listed below.

- Plutonium Processing and Handling
- Special Nuclear Materials Storage
- Explosive
- Uranium Enrichment
- Uranium Conversion/Processing and Handling
- Irradiated Fissile Material Storage
- Reprocessing
- Nuclear Waste Operations
- Tritium Activities
- Fusion Activities
- Environmental Restoration Operations
- Category “A” Reactors
- Category “B” Reactors
- Solar Activities
- Fossil and Petroleum Reserves
- Accelerators
- Balance-of-Plant (e.g., offices, machine shops, site/outside utilities, safeguards/security, and transportation)

The following terms are related to occurrence reporting, as required by DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.

Occurrence Categories (Types of Occurrences)

Occurrence categories are arranged into 10 generic groups related to DOE operations and include the following:

1. Facility Condition
2. Environmental
3. Personnel Safety
4. Personnel Radiation Protection
5. Safeguards and Security
6. Transportation
7. Value Basis Reporting
8. Facility Status
9. Nuclear Explosive Safety
10. Cross-Category Items

Price-Anderson Amendments Act (PAAA)

Price-Anderson Amendments Act (PAAA). The 1988 Price-Anderson Amendments Act extended indemnification to DOE operating contractors for consequences of a nuclear incident. At the same time, Congress required DOE to begin undertaking enforcement actions against those contractors who violate nuclear safety rules. The regulatory basis for the enforcement program is published in 10CFR820, Procedural Rules for DOE Nuclear Activities. Enforcement actions may include the issuance of Notices of Violations and, where appropriate, civil monetary penalties of up to $100,000 per violation per day. The mechanism allows DOE to penalize a contractor for unsafe actions or conditions while providing positive incentives for contractors to strive for an enhanced nuclear safety culture through attention to compliance to standards and requirements, self-identification of problems, reporting noncompliance's to DOE and initiating timely and effective corrective actions.

Severity of Occurrence

Severity of occurrence indicates the degree of significance associated with the different types of occurrences.

- Unusual Occurrence: A non-emergency occurrence that exceeds the Off-Normal Occurrence threshold criteria; is related to safety, environment, health, security, or operations; and requires immediate notification to DOE.
- Off-Normal Occurrence: Abnormal or unplanned event or condition that adversely affects, potentially affects, or is indicative of degradation in the safety, safeguards and security, environmental or health protection, performance, or operation of a facility.

Statistical Process Control (SPC)

Statistical Process Control (SPC) is the application of statistical techniques to control a process.

Total Effective Dose Equivalent (TEDE)

TEDE = External Dose Contribution + Internal Dose Contribution. Prior to 1993, the method for calculating the internal dose contribution changed from an annual internal dose to a dose committed over 50 years. Although one may expect this change would result in higher reported doses, the elimination of the "legacy" doses from previous years' exposures resulted in lower reported doses.

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Product Improvement Survey Form

Purpose of the Product - The Office of Operating Experience Analysis and Feedback, EH-33, is developing a set of indicators for measuring the performance of DOE operations in the areas of Worker Safety and Health and the Environment. The indicators are intended to measure the Department's success in it strategic goal to manage and improve its environmental, safety, and health (ES&H) performance. The major customers for these indicators are expected to be the senior leadership of DOE.

In order to assess the effectiveness of this new performance indicator report, we would appreciate your assistance by providing responses to the following (check one):

1. Do you use indicators to measure performance? ☐ Yes ☐ No
2. Do you feel that improved methods for measuring performance are needed? ☐ Yes ☐ No
3. Would you make management decisions based on this kind of information? ☐ Yes ☐ No
4. Does DOE-wide ES&H performance matter to you? ☐ Yes ☐ No
5. What are your information needs with regard to measuring Department-wide ES&H success:

   ☐ Moderate detail concerning the Department ES&H success
   ☐ Light detail concerning the Department ES&H success
   ☐ Quickpulse of the Department ES&H success
   ☐ I have no need for the information on a regular basis

Report Evaluation - From your review of this report, ***and in consideration of the purpose stated above***, mark the number that most closely corresponds to your reaction to the following statements.

	Strongly Agree			***Neutral***			***Strongly Disagree***
6. The performance indicators are relevant to the measurement of overall DOE ES&H performance.	⑦	⑥	⑤	④	③	②	①
7. The report layout (text and graphics) is logical and easy to understand.	⑦	⑥	⑤	④	③	②	①
8. The data presented in this report are consistent with my impressions of DOE's ES&H performance.	⑦	⑥	⑤	④	③	②	①
9. The performance indicators provide a "balanced" view (e.g., successses and problems) of DOE's ES&H performance.	⑦	⑥	⑤	④	③	②	①
10. This report concept can help measure DOE's success in managing and improving its ES&H performance.	⑦	⑥	⑤	④	③	②	①
11. This report concept can be useful in communicating information on DOE's ES&H performance to external customers.	⑦	⑥	⑤	④	③	②	①

12. Would you be willing to expend time/travel funds to participate in product improvement sessions? ☐ Yes ☐ No
13. Based upon your stated needs, does this report meet your expectations? ☐ Yes ☐ No

Mail or FAX to:

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DOE Operating Experience Analysis
Safety Management Through Analysis

Page 1 of _____

From:

Name: _____

Organization: _____

Phone: _____

Comments: What additional parameter(s) should be monitored and where could the data be obtained? Consider changes required to make this report more useful for your needs and specify any general observations based on your review. Use additional pages as necessary.

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